

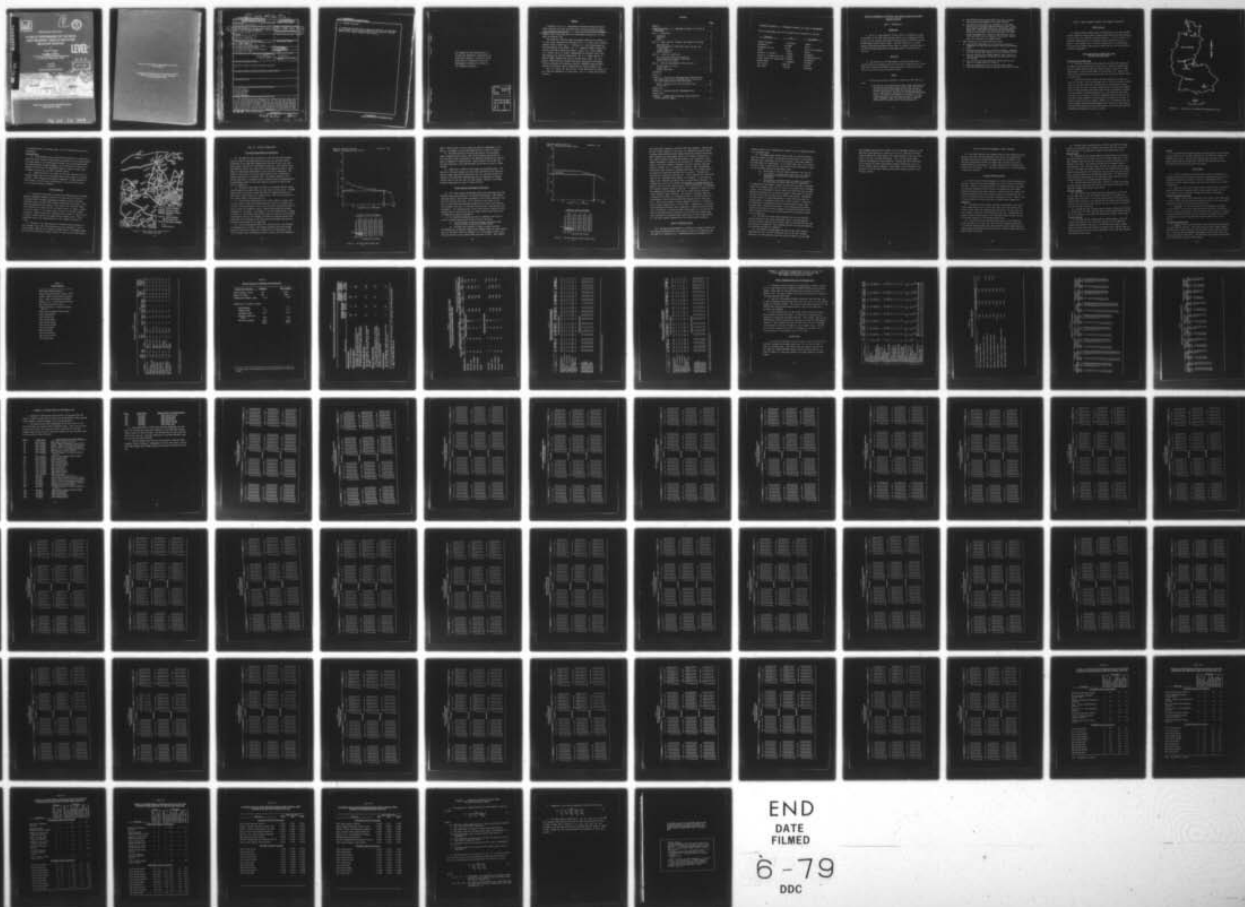
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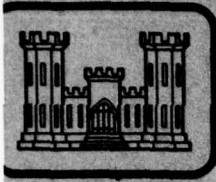


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MOBILITY PERFORMANCE OF THE M578 LIGHT RECOVERY VEHICLE AND OTHER SELECTED VEHICLES

by

Donald D. Randolph

~~Geotechnical Laboratory~~

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P. O. Box 631, Vicksburg, Miss. 39180

March 1979

Final Report

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20. ABSTRACT (Continued).

→ These data were then used to compare the mobility of the M578 Light Recovery Vehicle towing selected vehicles with the mobility of the M88 Medium Recovery Vehicle towing the same vehicles.

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PREFACE

Personnel of the U. S. Army Engineer Waterways Experiment Station (WES) conducted the study described herein during the period December 1978 to February 1979 for the U. S. Army Training and Doctrine Command (TRADOC) under Intra Army Order for Reimbursable Services No. CD 17-79 dated 26 December 1978.

The study was conducted under the general supervision of Messrs. J. P. Sale, Chief, Geotechnical Laboratory (GL); E. S. Rush, Chief, Mobility Systems Division (MSD); and C. J. Nuttall, Jr., Chief, Methodology and Modeling Research Group (MMRG). Mr. D. D. Randolph (MMRG) directed the overall study and prepared this report. Messrs. R. P. Smith (MMRG), R. B. Ahlvin, and B. R. Wright, Computations and Analysis Group (CAG), MSD, prepared the mobility predictions. Mr. R. G. Temple and Ms. E. P. Roberts, MRMG, prepared the vehicle characteristics data. Mr. Lynn Martin, Tank-Automotive Concepts Laboratory, Exploratory Development Division, Analysis and Evaluation Function, TARADCOM, supported WES's efforts in collecting vehicle characteristics and performance data.

COL J. L. Cannon, CE, was Director of the WES during the conduct of the study and preparation of this report. Mr. F. R. Brown was Technical Director.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

Units of measurement used in this report can be converted as follows:

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
degrees (angular)	0.01745329	radians
horsepower	745.6999	watts
horsepower per ton	82.82	watts per kilonewton
inches	0.0254	metres
miles (U. S. statute)	1.609344	kilometres
miles (U. S. statute) per hour	1.609344	kilometres per hour
pounds (force) per square inch	6.894757	kilopascals
pounds (mass)	0.45359237	kilograms
tons (force)	8896.444	newtons
tons (mass)	907.185	kilograms

MOBILITY PERFORMANCE OF THE M578 LIGHT RECOVERY VEHICLE AND OTHER
SELECTED VEHICLES

PART I: INTRODUCTION

Background

1. The U. S. Army Logistics Center (LOGC) is conducting a study to determine if the M578 Light Recovery Vehicle is an adequate recovery vehicle for the Infantry and Cavalry Fighting Vehicles (IFV/CFV) and the Ground Support Rocket System (GSRS). The LOGC asked the U. S. Army Engineer Waterways Experiment Station (WES) to support the LOGC study of the M578 by developing mobility performance data for selected study vehicles.

Objective

2. The objective of the WES support of the M578 study was to provide mobility performance data for the selected study vehicles in the HIMO¹ West Germany and Mid-East study areas and to compare the study vehicles at the five tactical mobility levels.

Scope

3. Principal activities necessary to achieve the WES objective were:

- a. The AMC-74X of the Army Mobility Model (AMM) (paragraph 18) was used to establish for each study vehicle the on- and off-road mobility performances for dry, wet, and snow surface conditions in the HIMO West Germany and the dry, wet, and sand surface conditions in the HIMO Mid-East study areas. The mobility performance was expressed in terms of speed profiles for each surface condition of primary roads, secondary roads, and off-road; and in terms of percent NOGO for trails and off-road (Appendix B).

- b. The SWIMCRIT water-crossing model² was used to predict water-crossing performance of the study vehicles.
 - c. The mobility rating speed was computed for each study vehicle at five tactical mobility levels for each of the three surface conditions and for all conditions combined (Part III). The levels of mobility and corresponding mobility rating speeds were those described in the HIMO Study¹ (paragraph 27). Three of these mobility levels (tactical high, tactical standard, and tactical support) were first defined by the WHEELS Study³.
- 4. Some limitations of this mobility study were:
 - a. The mobility assessment for this study was limited to comparison of study vehicles based on mobility performance alone.
 - b. Vehicles were assumed to be in prime condition, operating at rated payload, and operated by fully competent drivers.
 - c. Vehicles towing other tracked vehicles were limited by a maximum speed specified as maximum for towing with recovery vehicles.
 - d. The off-road mobility predictions (speed profiles) are based on a single pass of a vehicle.
 - e. Mobility predictions, both on- and off-road, reflect only the steering required to negotiate the road or terrain.

PART II: STUDY VEHICLES, TERRAIN, AND SCENARIO CONDITIONS

Study Vehicles

5. Eight tracked vehicles and ten combinations of the M578 and M88 recovery vehicles towing tracked vehicles were selected as study vehicles. A list of the study vehicles is given in Table 1. A list of some of the important characteristics of the eight tracked vehicles is given in Table 2. The complete list of vehicle characteristics and performance data used by the AMM to make mobility predictions for the study vehicles is given in Appendix A.

Brief Description of HIMO Road, Areal Terrain, and Linear Data

Road and areal terrain data

6. The road and areal terrain data for the HIMO West Germany and Mid-East study areas were used in this study. The West Germany study area is located between Fulda and Giessen (Figure 1) and the Mid-East study area is located around Amman in Jordan (Figure 2). Each of the study areas contains about 3000 sq km and were selected by TRADOC during the HIMO study.

7. The road and areal terrain data were prepared from maps at a scale of 1:50,000. The resulting maps used to describe the areal terrain units for the HIMO study were considered to be "study-quality" maps. That is, specific values for many terrain factors involved were largely inferred from available qualitative data sources interpreted in context of local climate, cultural practices, etc., but no ground truth data were used. As a result, it cannot be guaranteed that the specific set of factor values assigned to a given point on a map will, in fact, be found at that point on the ground. However, it is considered that the area as mapped is generally representative of the levels, associations, and areal distribution of those factors that influence vehicle mobility performance throughout the area as a whole.

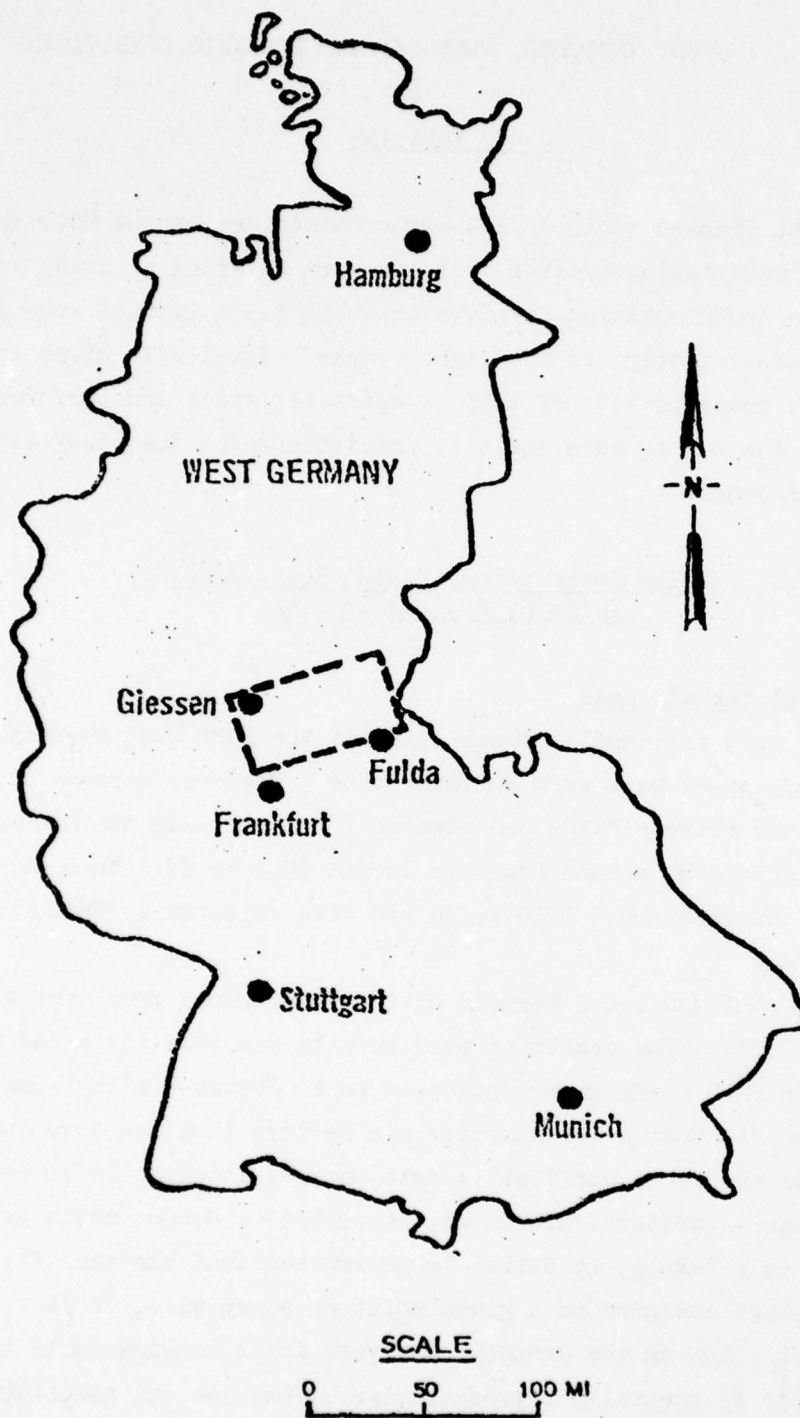


Figure 1. Location of the HIMO West Germany study area

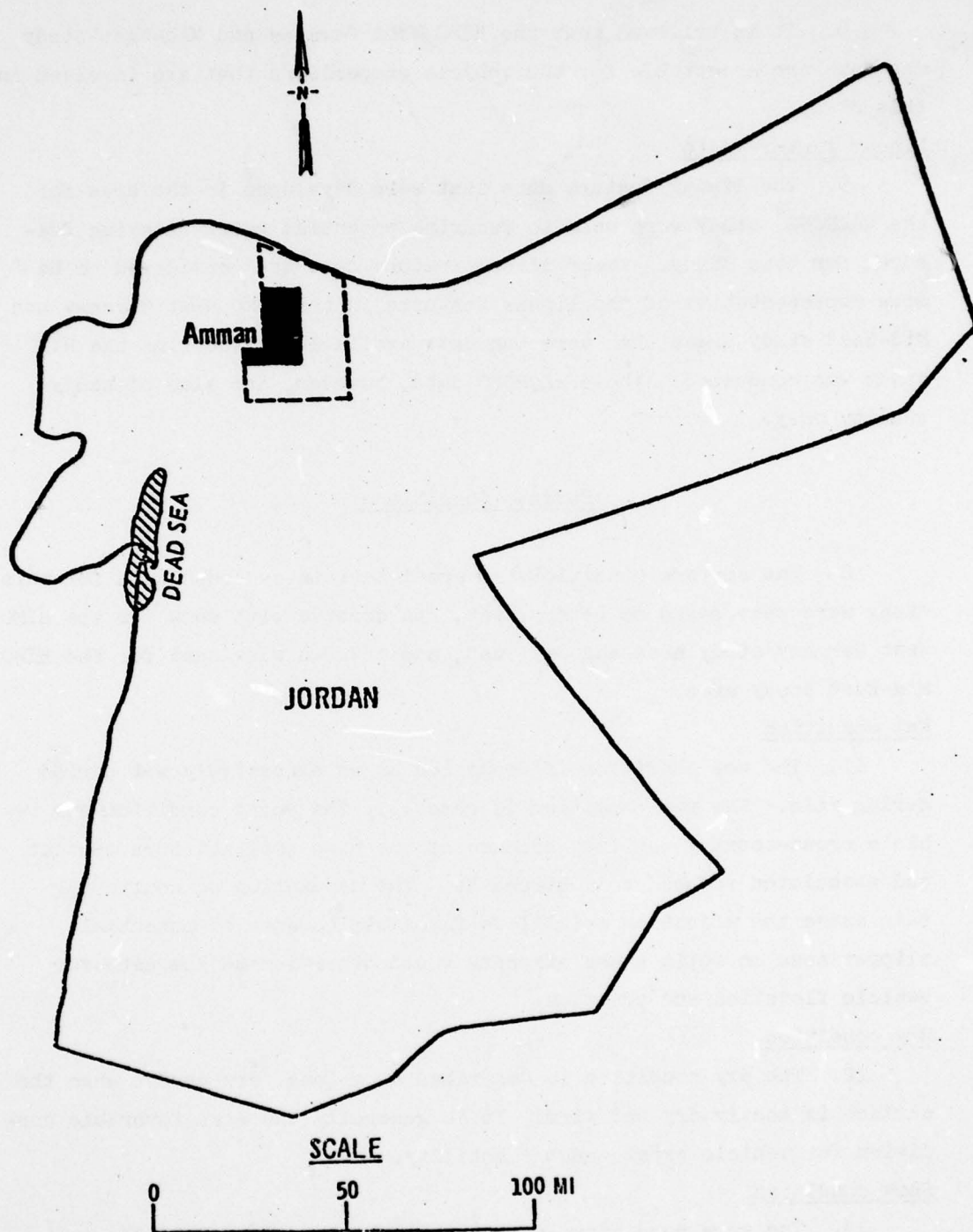


Figure 2. Location of HIMO Mid-East study area

8. It is believed that the HIMO West Germany and Mid-East study map data are acceptable for the vehicle comparisons that are involved in this study.

Linear feature data

9. The linear feature data that were developed in the area for the WACROSS⁴ study were used to describe potential water-crossing features for this study. These linear feature data are considered to be more representative of the linear features in the HIMO West Germany and Mid-East study areas than were the data available at the time the HIMO study was conducted. These WACROSS data, however, are also of study quality only.

Surface Conditions

10. The surface conditions of areal terrain and road data for this study were considered to be dry, wet, and covered with snow for the HIMO West Germany study area and dry, wet, and covered with sand for the HIMO Mid-East study area.

Wet condition

11. The wet condition is described as an excessively wet period during rain. The wet condition is generally the worst condition for vehicle cross-country mobility because of the high soil-moisture content and associated reduced soil strengths. The assumption of continuing rain makes the situation still less favorable because of potential slipperiness on soils whose strength would otherwise be adequate for vehicle flotation and traction.

Dry condition

12. The dry condition is described as a long, dry period when the surface is mostly dry and firm. It is generally the most favorable condition for vehicle cross-country mobility.

Snow condition

13. The snow condition assumes that the terrain and trails are frozen and uniformly covered by 10 in. of dry snow, which is a reasonable maximum average depth for the area. Differences in snow depth

or characteristics in forested areas, or due to drifting snow, are not considered.

Sand condition

14. In the Mid-East area, predictions were made for a condition in which the actual terrain was arbitrarily converted to an all-sand terrain with sand dunes by (a) converting all actual soils to dry desert sands with appropriately reduced strengths, and (b) doubling all slopes to a maximum of 60 percent (the approximate angle of repose of sand dunes, frequently found on the lee side of desert dunes).

15. Characteristics of all roads for the sand condition were unchanged, except that the soil-surfaced trails were assumed to be trails on sand. These changes are considered reasonable in large expanses of dune terrain, but the actual configuration of the terrain and roads is, of course, entirely synthetic.

Study Scenarios

16. During the HIMO study, personnel from TRADOC schools and study agencies designated movement routes at 1:50,000 scale for portions of authorized TRADOC scenarios representing defense, attack, and delay operations within the HIMO West Germany and Mid-East study areas. They indicated appropriate main supply routes (MSR's) and secondary supply roads between each combat unit and concurrent points of supply. Figure 3 shows an example of the supply routes for part of the West Germany study area. Similar routes were designated for a number of typical runs by combat, combat support, and combat service support units. Table 3 summarizes some of the characteristics of the composite network of routes.

17. Because of the high density of secondary roads and trails in West Germany, very little off-road operation was considered to be required except under the local impact of enemy action. The MidEast study area required traversing a larger portion of trails and off-road terrain.

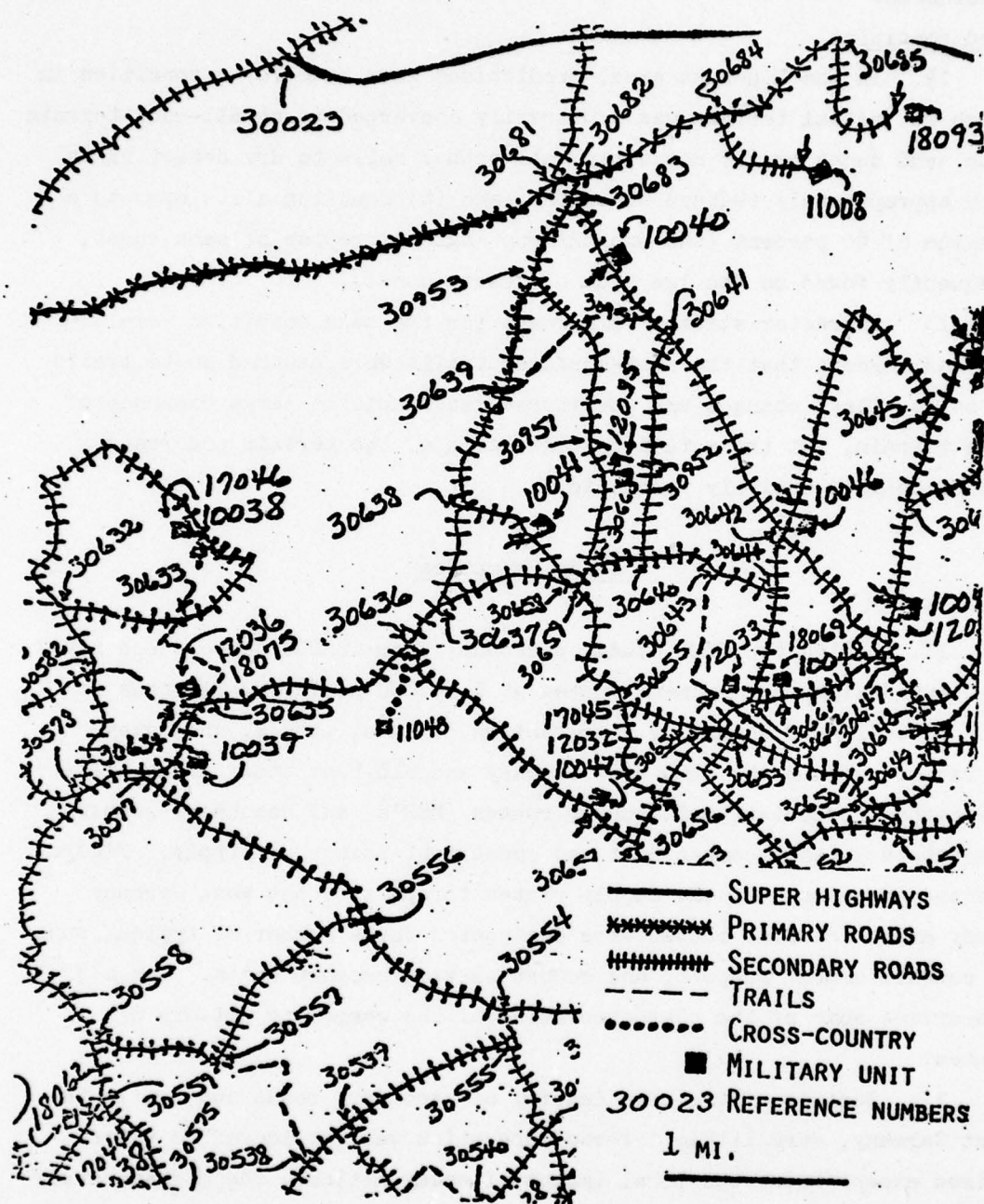


Figure 3. Partial supply route network map for West Germany study area

PART III: MOBILITY PREDICTIONS

On- and Off-Road Mobility Predictions

18. The AMM¹ was used to predict on- and off-road speed performances for each of the study vehicles for dry, wet, and snow surface conditions in the HIMO West Germany study area and the dry, wet, and sand surface conditions of the Mid-East study area. The version of the AMM (AMC-74X) used in this study was the first-generation AMC-71 with a number of significant improvements in the predictive algorithms. The inputs to this model are vehicle characteristics and a quantitative terrain description of the study area. The general content of the terrain data base is indicated, and the detailed vehicle characteristics and performance data for the study vehicles required for AMC-74X are given in Appendix A.

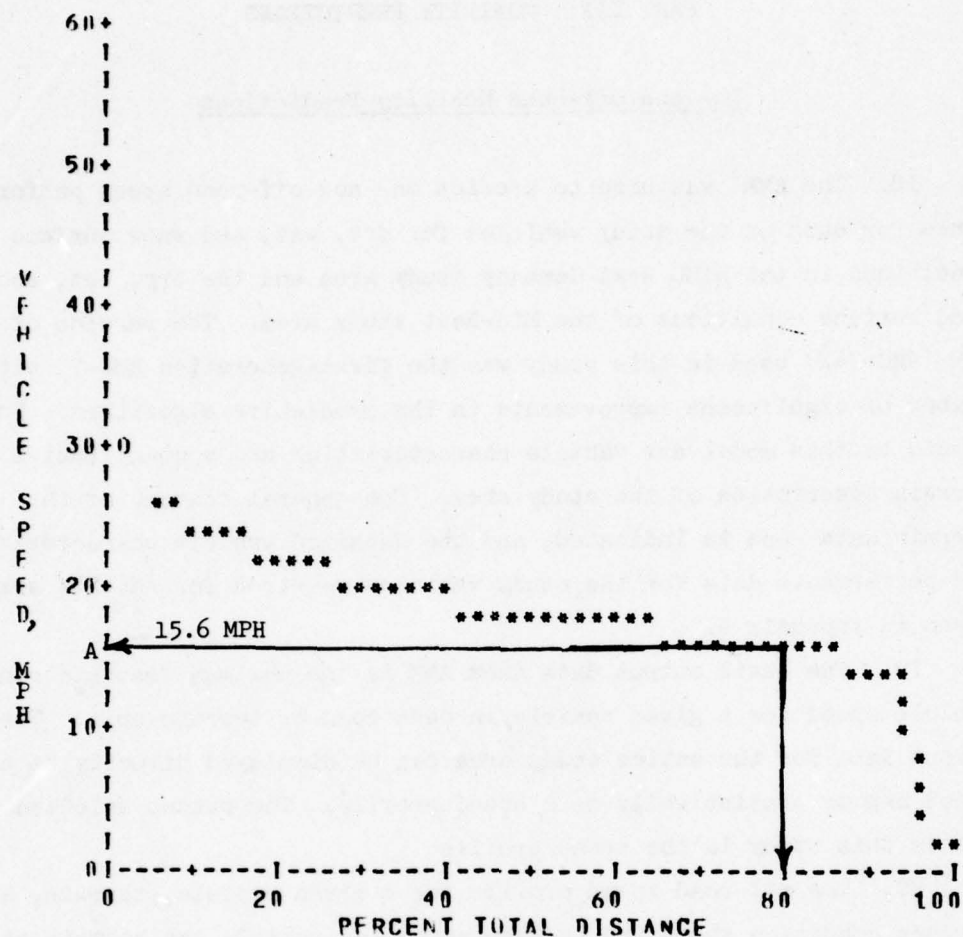
19. The basic output data from AMM is the maximum feasible single vehicle speed for a given vehicle in each road or terrain unit. The AMM output data for the entire study area can be displayed directly as a speed map or statistically as a speed profile. The output selected for use in this study is the speed profile.

20. The off-road speed profile for a given vehicle, terrain, and surface condition shows the average speed the vehicle can sustain as a function of the percentage of the total area under consideration that it avoids, under the assumption that it avoids areas posing the greatest impediment to its motion. An example of off-road speed profile is given in Figure 4. This sample speed profile shows, at point A, that the M758 Light Recovery Vehicle can average 15.6 mph while negotiating the best 80 percent of the terrain in the study area and avoiding the worst 20 percent of the terrain in the same area.

21. The on-road speed profile for a given vehicle, road (primary or secondary road or trail), and surface condition shows the average speed the vehicle can sustain as a function of the percentage of the total distance under consideration that it avoids, under the assumption

HIMO West Germany Study Area
 Vehicle: M578 Light Recovery Vehicle

Condition: Dry



	PERCENT TOTAL DISTANCE				
	X=0	2	4	6	8
X	33.8	30.8	27.9	26.4	25.5
1X	24.9	24.5	23.8	23.2	22.7
2X	22.2	21.8	21.5	21.1	20.8
3X	20.4	20.1	19.8	19.5	19.2
4X	19.0	18.8	18.6	18.4	18.3
5X	18.1	18.0	17.8	17.7	17.5
6X	17.4	17.2	17.1	16.9	16.8
7X	16.6	16.4	16.2	16.0	15.8
8X	15.6	15.4	15.2	15.0	14.8
9X	14.5	14.2	13.6	5.1	2.5
10X	1.7				

ACCUMULATED SPEED

Figure 4. Off-road speed profile data

that it avoids roads or trails posing the greatest impediment to its motion. An example of an on-road speed profile is given in Figure 5.

22. The speed profiles for each study vehicle on the primary roads, secondary roads, trails, and off-road terrain during the dry, wet, and snow surface conditions in the HIMO West Germany study area are given in Appendix B, Tables B1-B18. Speed profiles for the dry, wet, and sand conditions of the HIMO Mid-East study area are given in Tables B19-B36.

23. There were no NOGOs on the primary and secondary roads. The percent of off-road terrain and trails that was NOGO and the reason for NOGO for each study vehicle during the dry, wet, and snow surface conditions in the HIMO West Germany study area are summarized in Tables B37-B39, and for the dry, wet, and sand surface condition of the HIMO Mid-East study area are given in Tables B40-B42.

Linear Feature Performance Predictions

24. The linear feature performance predictions were made using the SWIMCRIT water-crossing model,² the WACROSS methodology⁴ a WES Engineer Assistance Model,⁵ and terrain description of the linear features in the HIMO West Germany study area. Due to the short time frame of this study, linear feature performance predictions for some of the vehicles were estimated from data for vehicles having similar characteristics and performance. The characteristics of the study vehicles required for the SWIMCRIT water-crossing model and the linear feature data required for the SWIMCRIT are given in Appendix A.

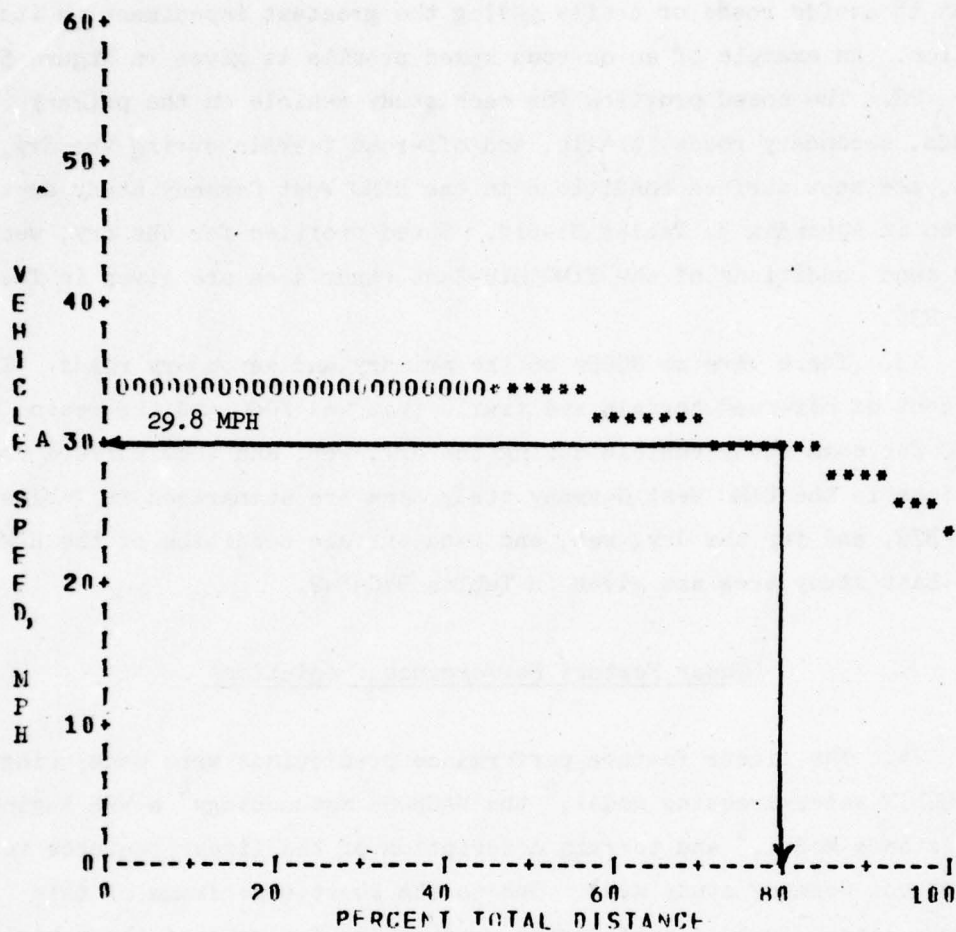
25. The WACROSS methodology was used to determine (for each vehicle, for three seasonal water stages, and for the area):

- a. The mean number of stream crossings necessarily negotiated per mile during cross-country travel.
- b. The mean time required to effect a single crossing.

The methodology, as applied, examined the WACROSS digitized linear feature data for the areas covered by eighteen 1- by 22-km sample strips across the area depicted on the central HIMO quad sheet (L5322). Nine samples

HIMO West Germany Study Area
 Vehicle: M578 Light Recovery Vehicle

Condition: Dry



PERCENT TOTAL DISTANCE

	X=0	2	4	6	8
X	34.0	34.0	34.0	34.0	34.0
1X	34.0	34.0	34.0	34.0	34.0
2X	34.0	34.0	34.0	34.0	34.0
3X	34.0	34.0	34.0	34.0	34.0
4X	34.0	34.0	34.0	33.9	33.8
5X	33.7	33.6	33.5	33.3	33.0
6X	32.6	32.2	31.9	31.6	31.3
7X	31.1	30.8	30.6	30.4	30.2
8X	29.8	29.5	29.1	28.7	28.1
9X	27.6	27.1	26.7	26.2	25.4
10X	24.7				

ACCUMULATED SPEED

Figure 5. On-road (primary) speed profile data

were north-south transects; nine were east-west transects. Moving from one end of each transect to the other, the computerized process avoids crossings where possible without going outside the transect bounds and, where crossings are unavoidable, selects the optimum crossing site. A site, when it exists, where the given vehicle can successfully cross without assistance is chosen as the optimum site. Otherwise, the site chosen is one that requires a minimum of critical engineer resources (dozers, bridges, etc.) to prepare for crossing. The corresponding construction time required is computed based upon site characteristics and added to an arbitrary waiting time of one hour. The mean time required per crossing is then given by: $(\text{total construction and waiting time for all crossings}) / (\text{total number of crossings})$. In the tactical support role, vehicles are rarely used on single-vehicle missions. In recognition of this, the crossing time assessed to a single vehicle was taken to be 1/10 of the computed value, which is equivalent to spreading the crossing "expense" among 10 vehicles. In Appendix B, Tables B43 and B44 summarize the performance data for the study vehicles crossing linear features (water-crossing). The product of the mean time per crossing and the number of crossings per mile of off-road terrain traversed gives a water-crossing coefficient having units of hours per mile. This index provides a simple comparative measure of a vehicle's water-crossing capabilities in a given area. Consequently, a vehicle's water-crossing coefficient can be expected to change from area to area. Table B43 presents a listing of these coefficients for each vehicle for each of the three surface conditions for the HIMO West Germany study area, and Table B44 presents these coefficients for each study vehicle for the three surface conditions for the HIMO Mid-East study area.

Tactical Mobility Levels

26. The mobility performance of a vehicle is a complex function of the vehicle characteristics, the terrain in which it is operating, and the task it is required to do. Expressing mobility performance in a

minimal reduced set of comprehensible numbers to aid in making decisions is a formidable task.

27. The WHEELS study defined three levels of tactical mobility. These are listed in Table 4 along with the definitions for two further mobility levels (high-high and on-road mobility), which were added to the HIMO study for completeness. In the HIMO study, each of the resulting five levels of mobility were also quantitatively described in terms of the following statistical performance data:

- a. Percentage of off-road travel expected of the vehicle.
- b. The severity of expected off-road travel (in terms of performance of the off-road terrain that should be negotiable).
- c. The severity of expected travel on trails (in terms of the percentage of trails that should be negotiable).

In computing on-road speeds, separate predictions were made for primary roads, for secondary roads, and for trails in accordance with constraint c above. The percentage of on-road travel was subdivided into the same categories according to the relative mileage of each found in the road network for the area developed in the HIMO scenario play. Assignment for each vehicle of proper percentages of total off-road travel, on primary roads, on secondary roads, and on trails (Table 5), along with the appropriate corresponding values for mean speeds in each travel category level, permitted calculation of an average mobility rating speed that the vehicle could be expected to maintain area-wide in the stated weather condition while performing missions requiring a stated level of mobility.

28. The mobility rating speed integrates the on- and off-road speed profiles and the linear performance values, the percentage of traverse distance operating on different types of road and off-road, and the severity of operation. The preceding was used to calculate mobility rating speeds described in Appendix C.

29. The mobility rating speeds for each of the study vehicles during the dry, wet, and snow conditions and for the "all" surface condition, for each mobility level, are given in Table 6 for the HIMO

West Germany study area and in Table 7 for the Mid-East study area. The mobility rating speed for a vehicle for the "all" condition was determined by taking the simple mean of the rating speeds for dry, wet, and snow or dry, wet, and sand conditions. This in effect gives equal weight to performance in each condition. Because the three conditions do not prevail for equal time periods during a normal year, this, in effect, assigns special emphasis to performance in bad conditions (wet and snow or wet and sand), which, subjectively, appears proper in the military context.

PART IV: MOBILITY ASSESSMENT OF STUDY VEHICLES

30. The study vehicles were compared based on their mobility rating speeds at the five tactical mobility levels and on the percent NOGO. The speed profiles and linear performance data are reflected in the mobility rating speed and help to explain why one vehicle may have a higher mobility rating speed. For these comparisons the vehicles were divided into two groups: (1) individual vehicles, and (2) M578 and M88 towing other vehicles.

Tactical Mobility Levels

31. Table 5 gives the percentages of on- and off-road traversed and percent of roads and terrain challenged for the five levels of tactical mobility. Since all the study vehicles are tracked vehicles, the tactical high and high-high mobility levels are suggested as the scenario normally associated with these vehicles. On-road, tactical support, and tactical standard values are included to permit evaluating these vehicles in areas where more roads may be available for use. Tables 6 and 7 show the mobility rating speeds used in making these comparisons.

High-high

32. The M109A1 had the highest mobility rating speed of the individual study vehicles for the dry, wet, snow, and "all" surface conditions of the HIMO West Germany study area and for the dry, sand, and "all" surface conditions of the Mid-East study area. The M88 had the highest mobility rating speed of the individual study vehicles for the wet surface condition of the Mid-East study area.

33. The M113A1 had the lowest mobility rating of the individual study vehicles for the dry, wet, snow, and "all" surface conditions of the HIMO West Germany study area, and the M578 had the lowest mobility rating speed for the dry, wet, sand, and "all" surface conditions of the HIMO Mid-East study area.

34. The M88 towed the M110E2, M107, IFV/CFV, and GSRS with higher mobility rating speeds than the M578 towed these vehicles for all surface conditions of the HIMO West Germany and Mid-East study areas.

Tactical high

35. The GSRS had the highest mobility rating speed of the individual study vehicles for dry, snow, and "all" surface conditions of the West Germany study area and the dry and sand surface conditions of the Mid-East study area. The GSRS and IFV/CFV had the highest mobility rating speed of the individual study vehicles for the wet surface condition of the HIMO West Germany study area. The IFV/CFV had the highest mobility rating speed of the individual study vehicles for the wet and "all" surface conditions of the Mid-East study area. The M578 had the lowest mobility rating speed of the individual study vehicles for all surface conditions of the HIMO Mid-East study area.

36. The M88 towed the M110E2, M107, IFV/CFV, and GSRS with higher mobility rating speeds than the M578 for all surface conditions of the HIMO West Germany and Mid-East study areas.

Tactical standard

37. The GSRS had the highest mobility rating speed of the individual study vehicles for all surface conditions of the HIMO West Germany study area and for the dry and sand surface conditions of the HIMO Mid-East study area. The IFV/CFV had the highest mobility rating speed of the individual study vehicles for the wet surface condition of the HIMO Mid-East study area.

38. The M88 had only slightly higher mobility rating speeds towing the M110E2, M107, IFV/CFV, and GSRS than the M578 towing these vehicles for all conditions of the HIMO West Germany and Mid-East study areas.

Tactical support

39. The GSRS had the highest mobility rating speed of the individual study vehicles for all surface conditions of the HIMO West Germany and Mid-East study areas. The M88 had only slightly higher mobility rating speeds when towing the M110E2, M107, IFV/CFV, than the M578 towing these vehicles for all conditions of the HIMO West Germany and Mid-East study areas.

On-road

40. The GSRS had the highest mobility rating speed of the individual study vehicles for all surface conditions of the HIMO West Germany and Mid-East study areas. The M88 had slightly higher mobility rating speeds when towing the M110E2, M107, IFV/CFV than the M578 for some of the HIMO West Germany and Mid-East study areas.

Percent NOGO

41. A NOGO situation is predicted when a vehicle configuration is immobilized under its own power and requires engineering effort, such as winching and towing, to continue. The use of engineering effort to retrieve a vehicle always requires time even when a winch or tow vehicle is available.

42. Only the trails and off-road terrain contained NOGO situations. Tables B37-B42 give the percent NOGO on trails and off-road for the study vehicles in the HIMO West Germany and Mid-East study areas.

HIMO West Germany study area

43. Trails. None of the individual study vehicles were immobilized on trails. Only the M578 towing the M110E2 and M107 in the snow surface condition resulted in NOGO situations (Table B39).

44. Off-road. All the study vehicles had some NOGO situations during the dry, wet, and snow condition (Tables B37-B39). The M113A1 had the largest percent NOGO of the individual study vehicles. The M578 towing the M110E2 and M109A1 had the largest percent NOGO of the towed combinations. Obstacle influence and traction caused most of the NOGO's.

HIMO Mid-East study area

45. Trails. None of the individual study vehicles were immobilized on trails (Tables B40-B42). The M578 towing the M107, M109A1, M110E2, and GSRS had 0.1 percent NOGO on trails during the wet condition (Table B41). Both the M578 and M88 had considerable percent NOGO trails for the sand condition (Table B42). The M578 had a much larger percent NOGO than the M88 when towing the same vehicle.

46. Off-road. All the study vehicles except the M109A1 during the dry and sand surface conditions had some NOGO situations (Tables B40-B42). The M578 had the largest percent NOGO of the individual study vehicles. The M109A1 had the lowest percent NOGO of the study vehicles. The percent NOGO for the M578 towing the M110E2, M107, IFV/CFV, and GSRS was always larger than for the M88 towing the same vehicles.

Summary Assessment

Tactical mobility levels

47. The GSRS and IFV/CFV had the highest mobility rating speeds for all of the surface conditions of the HIMO West Germany and Mid-East study areas at all tactical mobility levels. The mobility rating speed of the M578 towing the IFV/CFV, GSRS, M107, and M110E2 for most conditions of both study areas was generally only slightly less than that of the M88 towing these vehicles.

Percent NOGO

48. The percent NOGO in off-road terrain in the dry, wet, and sand conditions of the Mid-East study area was generally much greater for the M578 than for the M88 towing the IFV/CFV, GSRS, M107, and M110E2. The percent NOGO in the off-road terrain in the dry, wet, and snow condition of the West Germany study area was only slightly greater for the M578 towing the IFV/CFV, GSRS, M107, and M110E2 than for the M88 towing these vehicles. Obstacle influence and traction were the principal reason for NOGO in both the study areas.

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Table 1
Study Vehicles

M578 Light Recovery Vehicle
M113A1 Armored Personnel Carrier (APC)
M109A1, 155mm, Self-Propelled Howitzer
M107, 175mm, Self-Propelled Howitzer
M110E2, 8 in., Self-Propelled Howitzer
M88, Medium Recovery Vehicle
IFV/CFV Infantry or Cavalry Fighting
Vehicle
GSRS, Ground Support Rocket System
M578 Towing M113A1
M578 Towing M107
M578 Towing M109A1
M578 Towing M110E2
M578 Towing IFV/CFV
M578 Towing GSRS
M88 Towing M107
M88 Towing M110E2
M88 Towing IFV/CFV
M88 Towing GSRS

Table 2
Important Characteristics of Study Vehicles

Vehicles	Gross Vehicle Weight, lb	Track Length, in.	Engine	Power to Weight Ratio hp/ton	Transmission	Approach Angle deg	Departure Angle deg	VCI ₁			Speeds for Obstacle Heights Indicated at 2.5 g, mph			Six-Watt Speeds for rms elev, mph			
								Fine Soils	Grained Soils*	Coarse Soils	Maximum Speed mph	4	6	10	1	2	3
M578 Light Recovery Vehicle	54,000	151	Detroit Diesel 8V71T	15.7	XTG-411-2A	75	36	20.4	0	0	34	100	17	12.6	30	16	13.8
M113A1 Armored Personnel Carrier (APC)	23,400	109	GM Diesel 6V53	17.5	TX100-1	70	40	16.0	0	0	42	100	100	13.0	23	13	10.4
M109A1, 155 mm, Self-Propelled Howitzer	53,060	159	Detroit Diesel 8V71T	15.7	XTG-411-2A	75	80.5	24.8	0	0	35	100	100	13.0	30	16	13.8
M107, 175 mm, Self-Propelled Howitzer	62,100	151	Detroit Diesel 8V71T	13.0	XTG-411-2A	90	43.5	22.5	0	0	34	100	100	13.0	30	16	13.8
M1082, 8 in., Self-Propelled Howitzer	62,100	151	Detroit Diesel 8V71T	13.7	XTG-411-2	90	44.5	22.5	0	0	34	100	100	13.0	30	16	13.8
M88 Medium Recovery Vehicle	112,000	183	Continental AVSI-1790-6A	17.5	XTL410-2	63	41.0	19.8	0	0	30	100	100	12.5	100	16	11.0
IFV/CFV Infantry/Cavalry Fighting Vehicle	47,000	157	Cummings VTA-903-T	21.28	HMPT-500	90	50.0	13.1	0	0	41	100	100	100.0	27	16	12.4
GSRS Ground Support Rocket System	52,000	173.5	Cummings VTA-903	17.3	HMPT-500	72	54.0	14.8	0	0	40	56	56	56.0	28.4	17	14.0

* VCI₁ assumed 0 for tracked vehicles.

Table 3

Characteristics of Composite Route Networks

<u>Study Area Features</u>	<u>Mid-East</u>	<u>West Germany</u>
Total distance, miles	533	1678
Number of links*	854	2184
Average link length, miles	0.62	<u>0.77</u>
Composition of network, percent		
Superhighways	0	3.1
Primary roads	7.3	21.1
Secondary roads	29.7	61.4
Tertiary roads and trails	44.9	14.3
Off-road traverse	<u>18.1</u>	<u>0.1</u>
	100.0	100.0

* A link is the route joining two route intersections or route end points.

Table 4

Preliminary Quantification of WHEELS Study Definitions of Tactical Mobility³

Mobility Level	Operating Distance		Severity of Operation	
	Off-Road Percent	On-Road* Percent	Off-Road* Percent of Terrain Challenged	On-Road Percent of Trails Included
<u>High-high mobility**</u>				
All off-road operation	100	0	100	-
<u>Tactical high mobility</u>				
The highest level of mobility designating the requirement for extensive cross-country maneuverability characteristic of operations in the ground-gaining and fire-support environment	50	50	90	100
<u>Tactical standard mobility</u>				
The second highest level of mobility designating the requirement for occasional cross-country movement	15	85	80	100
<u>Tactical support mobility</u>				
A level of mobility designating the requirement for infrequent off-road operations over selected terrain with the preponderance of movement on primary and secondary roads	5	95	50	50
<u>On-road mobility**</u>				
All on superhighways, primary and secondary roads, and the best tertiary roads and trails	0	100	-	10

* In terms of percentage of best off-road terrain to be challenged (off-road speed profile).

** NOT a WHEELS Study definition.

Table 5
Network Composition and Severity at Tactical Mobility Levels
for HIMO West Germany and Mid-East Study Areas

Mobility Levels	Composition of Network in Percent				Severity of Operation in Terms of Percent of Terrain and Roads Challenged			
	Primary Roads		Secondary Roads		Primary Roads		Secondary Roads	
	(P _p)	(P _s)	(P _p)	(P _s)	(V _{pp})	(V _{sp})	(V _{tp})	(V _c)
HIMO West Germany Study Area								
High-High	0	0	0	100	-	-	-	V ₁₀₀
Tactical High	10	30	10	50	V ₁₀₀	V ₁₀₀	V ₁₀₀	V ₉₀
Tactical Standard	20	50	15	15	V ₁₀₀	V ₁₀₀	V ₁₀₀	V ₈₀
Tactical Support	30	55	10	5	V ₁₀₀	V ₁₀₀	V ₅₀	V ₅₀
On-Road	35	60	5	0	V ₁₀₀	V ₁₀₀	V ₁₀	-
HIMO Mid-East Study Area								
High-High	0	0	0	100	-	-	-	V ₁₀₀
Tactical High	5	20	25	50	V ₁₀₀	V ₁₀₀	V ₁₀₀	V ₉₀
Tactical Standard	15	35	35	15	V ₁₀₀	V ₁₀₀	V ₁₀₀	V ₈₀
Tactical Support	20	40	35	5	V ₁₀₀	V ₁₀₀	V ₈₀	V ₅₀
On-Road	30	40	30	0	V ₁₀₀	V ₁₀₀	V ₅₀	-

Table 6

Summary of Study Vehicles Mobility Rating Speeds for
the Tactical Mobility Levels in HIMO West Germany

Vehicles	On-Road				Tactical Support				Tactical Standard				Tactical High				High-High			
	Dry	Wet	Snow	All	Dry	Wet	Snow	All	Dry	Wet	Snow	All	Dry	Wet	Snow	All	Dry	Wet	Snow	All
Individual Vehicle Performance																				
M578 Light Recovery Vehicle	22.8	21.7	21.0	21.8	21.0	19.7	19.4	20.0	17.4	16.0	16.1	16.5	12.4	10.8	11.3	11.5	1.6	1.5	1.6	1.6
M113AI Armored Personnel Carrier (APC)	25.8	24.5	22.6	24.2	22.9	21.5	20.3	21.5	17.8	16.5	16.1	16.8	11.7	10.4	10.6	10.9	1.2	1.1	1.1	1.1
M109AI, 155 mm, Self-Propelled Howitzer	22.5	21.5	20.5	21.5	20.9	19.6	19.3	19.9	17.3	15.9	16.1	16.4	12.2	10.6	11.2	11.3	5.2	3.5	2.4	3.4
M107, 175 mm, Self-Propelled Howitzer	22.3	21.3	20.5	21.3	20.7	19.4	19.1	19.7	17.1	15.6	15.8	16.1	11.9	10.3	10.9	11.0	2.7	2.2	2.1	2.3
M1082, 8 in., Self-Propelled Howitzer	22.3	21.3	20.5	21.3	20.7	19.4	19.1	19.7	17.0	15.6	15.8	16.1	11.8	10.2	10.9	10.9	3.4	2.8	2.3	2.8
M88 Medium Recovery Vehicle	22.4	21.5	20.5	21.4	21.2	20.1	19.5	20.2	17.7	16.6	16.5	16.9	12.9	11.6	12.0	12.1	2.4	2.3	2.3	2.3
IFV/CFV Infantry/Cavalry Fighting Vehicle	27.0	25.7	23.3	25.2	24.8	23.5	21.8	23.3	20.3	19.1	18.2	19.2	14.4	13.1	13.1	13.5	2.8	1.5	1.4	1.7
GSRS Ground Support Rocket System	27.4	26.0	23.5	25.5	25.4	23.8	22.1	23.7	21.0	19.3	18.6	19.6	15.2	13.1	13.5	13.9	2.4	1.5	1.3	1.6
M578/M88 Towing Performance*																				
M578 Towing M113AI	9.8	9.8	9.8	9.8	9.6	9.5	9.6	9.6	9.0	8.8	9.0	8.9	7.7	7.2	7.5	7.5	1.2	1.2	1.2	1.2
M578 Towing M107	9.4	9.4	7.8	8.8	9.2	9.0	7.7	8.6	8.5	8.0	6.9	7.7	7.0	6.1	5.3	6.1	1.4	1.2	0.9	1.1
M578 Towing M109AI	9.5	9.5	9.6	9.5	9.3	9.1	9.4	9.3	8.6	8.2	8.6	8.5	7.1	6.4	6.8	6.8	1.3	1.2	1.2	1.2
M578 Towing M1082	9.4	9.4	7.8	8.8	9.2	9.0	7.7	8.6	8.5	8.0	6.9	7.7	7.0	6.1	4.5	5.7	1.3	1.1	0.8	1.0
M578 Towing IFV/CFV	9.6	9.6	9.7	9.6	9.4	9.3	9.4	9.4	8.7	8.4	8.7	8.6	7.2	6.6	7.0	6.9	1.4	1.2	1.3	1.3
M578 Towing GSRS	9.5	9.5	9.6	9.5	9.3	9.2	9.4	9.3	8.6	8.3	8.6	8.5	7.2	6.5	6.8	6.8	1.3	1.2	1.2	1.2
M88 Towing M107	9.9	9.9	9.9	9.9	9.7	9.7	9.7	9.7	9.2	9.1	9.1	9.1	7.9	7.5	7.7	7.7	1.7	1.6	1.7	1.7
M88 Towing M1082	9.9	9.9	9.9	9.9	9.7	9.7	9.7	9.7	9.2	9.1	9.1	9.1	7.9	7.5	7.7	7.7	1.6	1.7	1.7	1.7
M88 Towing IFV/CFV	9.9	9.9	9.9	9.9	9.8	9.7	9.7	9.7	9.3	9.1	9.2	9.2	7.9	7.6	7.8	7.8	1.9	1.7	1.7	1.8
M88 Towing GSRS	9.9	9.9	9.9	9.9	9.8	9.7	9.7	9.7	9.2	9.1	9.2	9.2	7.9	7.6	7.8	7.8	1.5	1.5	1.4	1.5

* Maximum speed of 10 mph allowed when towing tracked vehicles.

APPENDIX A: DATA USED TO CHARACTERIZE THE STUDY VEHICLES AND
A BRIEF DESCRIPTION OF FACTORS USED IN DESCRIBING HIMO
WEST GERMANY AND MID-EAST STUDY AREAS

Vehicle Characteristics and Performance Data

1. Extensive data are required to characterize a vehicle to predict its performance with the AMM and SWIMCRIT/WACROSS water-crossing models. These data for the individual study vehicles are given in Tables A1-A5. The data in Tables A1-A5 are also sufficient to describe the study vehicles when towed.

2. Tractive force-speed relations determined from test data conducted at Aberdeen Proving Ground (APG) were used for all of the vehicles except the IFV/CFV and GSRS. The tractive force-speed relations for the IFV/CFV were obtained from General Electric and for the GSRS were obtained from TARADCOM.

3. Ride dynamics data for the M109A1, M110E2, M107, and M113A1, were obtained from WES test data⁶. The M578 has a suspension and, therefore, was assigned the same ride data. Ride dynamics data for the IFV/CFV were obtained by WES using suspension data and the AMM Dynamic Submodel⁷. Ride dynamics data for the GSRS were obtained by TARADCOM using suspension data and the AMM for use in another study. The M88 has a similar suspension to that of the M60A1 and, therefore, was assigned measured ride dynamics data for the M60A1.

Terrain Data

4. A detailed description of the procedures used to describe the HIMO West Germany and Mid-East study areas for use with the AMM is given in the HIMO study. The terrain and road factors required for the (AMC-74X) SWIMCRIT/WACROSS water-crossing prediction models are given in Table A6 to show the content of the data required for these models.

Table A1
Vehicle Characteristics Used in Army Mobility Model (AMM)

Table A2
Gear Ratios for Study Vehicles

Vehicles	Gear Ratios for Vehicles		
M578 Light Recovery Vehicle	4.69	3.18	1.59
M113 Armored Personnel Carrier (APC)	3.81	1.94	1.00
M109A1, 155 mm, Self-Propelled Howitzer	4.69	3.18	1.58
M107, 175 mm, Self-Propelled Howitzer	4.69	3.18	1.59
M110E2, 8 in., Self-Propelled Howitzer	4.69	3.18	1.59
M88 Medium Recovery Vehicle	112.30	24.50	6.80
IFV/CFV Infantry or Cavalry Fighting Vehicle	3.00	2.00	1.00
GSRS Ground Support Rocket System	3.00	2.00	1.00

Table A3
Tractive Force - Vehicle Speed Relations

[illegible]

Table A5
Ride Dynamic Vehicle Speed* - Surface Roughness Relations

M578 Light Recovery Vehicle	M113 Armored Personnel Carrier (APC)		M109A1, 155 mm, Self-Propelled Howitzer		M107, 175 mm, Self-Propelled Howitzer		M110B2, 8 in., Self-Propelled Howitzer		M88 Medium Recovery Vehicle		IFV/CFV Infantry or Cavalry Fighting Vehicle		GSR Support Rocket System	
rms in.	rms in.	Speed mph	rms in.	Speed mph	rms in.	Speed mph	rms in.	Speed mph	rms in.	Speed mph	rms in.	Speed mph	rms in.	Speed mph
0	0	100.0	0	80.0	0	80.0	0	80.0	0	100.0	0	100.0	0	56.0
4.10	0.40	100.0	0.33	60.0	0.33	60.0	0.33	60.0	1.00	100.0	0.20	100.0	0.60	55.0
4.20	0.60	35.5	0.50	51.0	0.50	51.0	0.50	51.0	1.20	36.0	0.60	100.0	0.66	45.0
4.33	0.80	27.0	0.72	40.0	0.72	40.0	0.72	40.0	1.40	26.0	0.70	39.0	0.80	36.0
4.58	1.00	23.0	0.90	33.0	0.90	33.0	0.90	33.0	1.60	21.0	0.80	34.0	0.94	30.0
4.90	1.20	20.0	1.00	30.0	1.00	30.0	1.00	30.0	1.80	18.0	1.00	27.0	1.00	28.4
5.30	1.40	17.5	1.15	26.0	1.15	26.0	1.15	26.0	2.00	16.0	1.20	23.0	1.25	24.0
5.70	1.60	15.5	1.30	21.0	1.30	21.0	1.30	21.0	2.20	14.0	1.40	20.5	1.50	20.8
6.00	1.80	14.0	1.41	20.0	1.41	20.0	1.41	20.0	2.40	13.0	1.60	18.5	1.75	18.8
7.00	2.00	13.0	1.50	19.0	1.50	19.0	1.50	19.0	2.60	12.5	1.80	17.0	2.00	17.0
8.20	2.20	12.0	1.60	18.0	1.60	18.0	1.60	18.0	2.80	12.0	2.00	16.0	2.50	15.0
9.40	2.40	11.8	1.75	17.0	1.75	17.0	1.75	17.0	3.00	11.0	2.20	15.1	3.00	14.0
10.20	2.60	11.2	1.80	16.5	1.80	16.5	1.80	16.5	3.50	10.0	2.40	14.2	4.00	10.8
12.00	2.80	10.9	2.00	16.0	2.00	16.0	2.00	16.0	4.00	9.0	2.60	13.7	5.00	8.8
60.00	3.00	10.4	2.25	15.0	2.25	15.0	2.25	15.0	4.50	8.0	2.80	13.0		
	3.50	9.5	2.50	14.8	2.50	14.8	2.50	14.8	5.00	7.0	3.00	12.4		
	4.00	8.9	2.75	14.0	2.75	14.0	2.75	14.0			3.50	11.1		
	4.50	8.2	3.00	13.8	3.00	13.8	3.00	13.8			4.00	10.0		
	5.00	8.0	8.00	13.5	8.00	13.5	8.00	13.5			4.50	9.5		
											5.00	9.0		

* Based on 6-watts absorbed power.

Table A6

Terrain Data Required for AMC-74X and SWIMCRIT
Water-crossing Prediction Models

<u>Terrain or Road Factor</u>	<u>Range</u>
<u>Off-Road</u>	
Surface material	NA
Type, USCS or other	NA
Mass strength, CI or RCI	0 - >280
Slope, percent	0 - >70
Obstacle	
Approach angle, deg	90 - 270
Vertical magnitude, cm	0 - >85
Length, m	0 - >150
Width, cm	0 - >1200
Spacing, m	0 - >60
Spacing, type	NA
Surface roughness, rms elevations	0 - 10
Stem diameter, cm } (8 pairs)	0 - >25
Stem spacing, m }	0 - >100
Visibility distance, m	0 - >50
Water depth, m	0 - >5
Water velocity, mps	0 - >3.5
Water width, m	0 - >70
Linear feature top width, m	0 - >70
Left approach angle, deg	90 - 270
Right approach angle, deg	90 - 270
Differential bank height or differential	
vertical magnitude, m	0 - >4
Low bank height or least vertical magnitude, m	0 - >6
<u>On-Road</u>	
Road type	NA
Surface material	NA
Type, USCS or other	NA
Surface strength	
Trails, CI or RCI	0 - >280
Other, traction coefficients	0.01 - >0.80
Slope, percent	0 - >70
Surface roughness, rms elevation	0 - >7.6
Curvature, deg	0 - 90
Roadside visibility distance (trails only), m	0 - >50

APPENDIX B: DETAILED MOBILITY PERFORMANCE DATA

1. Appendix B contains the speed profiles, the percent NOGO and reason for NOGO on trails and off-road, and the performance data crossing linear features (water crossings) for the study vehicles.

2. The speed profile data (paragraphs 20-22, main text) for the study vehicles over primary roads, secondary roads, trails, and off-road terrain for the dry, wet, and snow surface conditions for the West Germany study area are given in Tables B1-B18 and for the Mid-East study area are given in Tables B19-B36.

<u>Table</u>	<u>Study Area</u>	<u>Speed Profile for Study Vehicle</u>
B1	West Germany	M578 Light Recovery Vehicle
B2	West Germany	M113A1 Armored Personnel Carrier (APC)
B3	West Germany	M109A1, 155mm, Self-Propelled Howitzer
B4	West Germany	M107, 175mm, Self-Propelled Howitzer
B5	West Germany	M110E2, 8 in., Self-Propelled Howitzer
B6	West Germany	M88, Medium Recovery Vehicle
B7	West Germany	IFV/CFV Infantry or Cavalry Fighting Vehicle
B8	West Germany	GSRS, Ground Support Rocket System
B9	West Germany	M578 Towing M113A1
B10	West Germany	M578 Towing M107
B11	West Germany	M578 Towing M109A1
B12	West Germany	M578 Towing M110E1
B13	West Germany	M578 Towing IFV/CFV
B14	West Germany	M578 Towing GSRS
B15	West Germany	M88 Towing M107
B16	West Germany	M88 Towing M110E2
B17	West Germany	M88 Towing IFV/CFV
B18	West Germany	M88 Towing GSRS
B19	Mid-East	M578 Light Recovery Vehicle
B20	Mid-East	M113 Armored Personnel Carrier (APC)
B21	Mid-East	M109A1, 155mm, Self-Propelled Howitzer
B22	Mid-East	M107, 175mm, Self-Propelled Howitzer
B23	Mid-East	M110E2, 8 in., Self-Propelled Howitzer
B24	Mid-East	M88 Medium Recovery Vehicle
B25	Mid-East	IFV/CFV Infantry or Cavalry Fighting Vehicle
B26	Mid-East	GSRS, Ground Support Rocket System
B27	Mid-East	M578 Towing M113A1
B28	Mid-East	M578 Towing M107
B29	Mid-East	M578 Towing M109A1
B30	Mid-East	M578 Towing M110E2

<u>Table</u>	<u>Study Area</u>	<u>Speed Profile for Study Vehicle</u>
B31	Mid-East	M78 Towing IFV/CFV
B32	Mid-East	M578 Towing GSRS
B33	Mid-East	M88 Towing M107
B34	Mid-East	M88 Towing M110E2
B35	Mid-East	M88 Towing IFV/CFV
B36	Mid-East	M88 Towing GSRS

3. The percent NOGO on trails and off-road (paragraph 23, main text) for the dry, wet, and snow conditions of the HIMO West Germany Study is given in Tables B37-B39. The percent NOGO on trails and off-road for the dry, wet, and sand conditions of the HIMO Mid-East study area is given in Tables B40-B42.

4. The performance data for the study vehicles crossing linear features (water crossings), (paragraphs 24 and 25, main text), for the HIMO West Germany and Mid-East study area are given in Tables B43 and B44.

Table B1
Speed Profile for M78, Light Recovery Vehicle
for HMD West Germany Study Area

Primary Roads			Secondary Roads			Trails			Off Road		
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
x=0	2	4	x=0	2	4	x=0	2	4	x=0	2	4
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 33.0	33.4	31.9	1X 33.0	30.8	27.9
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 29.6	28.4	27.4	1X 24.9	24.5	23.8
2X 34.0	34.0	34.0	2X 33.9	33.9	33.8	2X 25.5	25.1	24.6	2X 22.2	21.8	21.5
3X 34.0	34.0	34.0	3X 33.3	33.1	32.9	3X 23.6	23.2	22.8	3X 20.4	20.1	19.8
4X 34.0	34.0	34.0	4X 32.0	31.6	31.2	4X 21.5	21.1	20.8	4X 19.0	18.8	18.4
5X 33.7	33.6	33.5	5X 30.1	29.7	29.4	5X 20.1	19.9	19.6	5X 18.1	18.0	17.7
6X 32.6	32.2	31.9	6X 28.6	28.4	28.0	6X 19.1	19.0	18.8	6X 17.4	17.2	17.1
7X 31.1	30.8	30.6	7X 27.5	27.3	27.0	7X 18.3	18.1	18.0	7X 16.6	16.4	16.2
8X 29.8	29.5	29.1	8X 26.0	25.7	25.3	8X 17.6	17.5	17.4	8X 15.6	15.4	15.2
9X 27.6	27.1	26.7	9X 24.1	23.7	23.3	9X 17.0	16.8	16.5	9X 14.5	14.2	13.6
10X 24.7			10X 21.5			10X 14.7			10X 11.9	11.6	11.1
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
x=0	2	4	x=0	2	4	x=0	2	4	x=0	2	4
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 30.6	28.9	27.2	1X 30.6	22.4	21.2
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 24.5	23.9	23.4	1X 19.0	18.4	18.2
2X 34.0	34.0	34.0	2X 33.9	33.9	33.6	2X 22.4	22.2	22.0	2X 17.3	17.0	16.6
3X 34.0	34.0	34.0	3X 33.2	33.0	32.7	3X 21.3	21.0	20.7	3X 16.2	15.7	15.4
4X 34.0	34.0	34.0	4X 31.6	31.4	31.0	4X 19.8	19.6	19.3	4X 15.2	15.0	14.8
5X 33.6	33.5	33.3	5X 29.6	29.5	29.2	5X 18.7	18.5	18.4	5X 14.4	14.3	14.1
6X 32.3	31.9	31.6	6X 28.4	28.2	28.0	6X 17.8	17.7	17.5	6X 13.9	13.8	13.7
7X 30.8	30.6	30.4	7X 27.3	27.0	26.7	7X 17.2	17.1	17.0	7X 13.4	13.3	13.1
8X 29.4	28.9	28.4	8X 25.6	25.2	24.8	8X 16.7	16.6	16.5	8X 12.7	12.6	12.5
9X 26.7	26.1	25.6	9X 23.4	23.0	22.6	9X 16.0	15.9	15.6	9X 11.9	11.6	11.1
10X 23.4			10X 20.7			10X 14.0			10X 11.9	11.6	11.1
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
x=0	2	4	x=0	2	4	x=0	2	4	x=0	2	4
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 34.0	33.9	33.3	1X 33.9	31.6	29.6
1X 34.0	34.0	34.0	1X 34.0	34.0	34.0	1X 31.2	30.4	29.7	1X 28.8	24.8	24.0
2X 34.0	34.0	34.0	2X 34.0	34.0	34.0	2X 27.3	26.7	26.1	2X 22.0	21.4	20.9
3X 34.0	34.0	34.0	3X 34.0	34.0	34.0	3X 24.6	24.3	23.8	3X 19.7	19.4	19.1
4X 34.0	34.0	34.0	4X 33.5	33.4	33.3	4X 22.3	21.9	21.5	4X 18.3	18.1	17.8
5X 34.8	33.9	33.6	5X 32.2	31.8	31.5	5X 20.7	20.4	20.2	5X 17.2	17.0	16.8
6X 33.2	33.0	32.9	6X 30.5	30.2	29.9	6X 19.6	19.5	19.3	6X 16.3	16.1	15.9
7X 32.4	32.3	32.0	7X 28.8	28.2	27.8	7X 18.7	18.5	18.4	7X 15.6	15.4	15.2
8X 30.7	30.1	29.5	8X 26.2	25.6	24.9	8X 17.9	17.8	17.7	8X 14.7	14.5	14.1
9X 27.4	26.7	26.1	9X 22.9	22.2	21.6	9X 17.3	17.1	16.8	9X 13.6	13.2	12.7
10X 23.7			10X 19.2			10X 14.9			10X 11.7		

Table B2

Speed Profile for MILAN, Armored Personnel Carrier (APC)
for HIMO West Germany Study Area

Primary Roads			Secondary Roads			Trails			Off Road		
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
X=0	2	4	X=0	2	4	X=0	2	4	X=0	2	4
1X 42.0 42.0 42.0 42.0 42.0			1X 42.0 42.0 42.0 42.0 42.0			1X 27.0 27.0 27.0 26.0 25.0			1X 41.0 36.4 33.0 32.7 31.7		
2X 42.0 42.0 42.0 42.0 42.0			2X 42.0 42.0 42.0 42.0 42.0			2X 27.0 27.0 27.0 26.0 25.0			2X 31.1 30.6 30.1 29.4 28.7		
3X 42.0 42.0 42.0 42.0 42.0			3X 42.0 42.0 42.0 42.0 42.0			3X 27.0 27.0 27.0 26.0 25.0			3X 28.1 27.6 27.2 26.8 26.4		
4X 42.0 42.0 42.0 42.0 42.0			4X 42.0 42.0 42.0 42.0 42.0			4X 27.0 27.0 27.0 26.0 25.0			4X 26.0 25.6 25.2 24.8 24.4		
5X 42.0 42.0 42.0 42.0 42.0			5X 42.0 42.0 42.0 42.0 42.0			5X 27.0 27.0 27.0 26.0 25.0			5X 23.9 23.5 23.1 22.8 22.4		
6X 42.0 42.0 42.0 42.0 42.0			6X 42.0 42.0 42.0 42.0 42.0			6X 27.0 27.0 27.0 26.0 25.0			6X 22.1 21.6 21.2 20.8 20.4		
7X 42.0 42.0 42.0 42.0 42.0			7X 42.0 42.0 42.0 42.0 42.0			7X 27.0 27.0 27.0 26.0 25.0			7X 19.4 19.1 18.8 18.5 18.1		
8X 42.0 42.0 42.0 42.0 42.0			8X 42.0 42.0 42.0 42.0 42.0			8X 27.0 27.0 27.0 26.0 25.0			8X 17.8 17.4 17.0 16.6 16.1		
9X 42.0 42.0 42.0 42.0 42.0			9X 42.0 42.0 42.0 42.0 42.0			9X 27.0 27.0 27.0 26.0 25.0			9X 15.4 14.5 5.2 2.5 1.7		
10X 20.2			10X 24.6			10X 13.1			10X 1.3		
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
X=0	2	4	X=0	2	4	X=0	2	4	X=0	2	4
1X 42.0 42.0 42.0 42.0 42.0			1X 42.0 42.0 42.0 42.0 42.0			1X 27.0 26.5 25.5 24.9 24.5			1X 30.2 28.4 27.2 26.2 25.3		
2X 42.0 42.0 42.0 42.0 42.0			2X 42.0 42.0 42.0 42.0 42.0			2X 23.0 22.6 22.5 22.1 21.7			2X 24.7 24.3 23.8 23.4 22.9		
3X 42.0 42.0 42.0 42.0 42.0			3X 42.0 42.0 42.0 42.0 42.0			3X 21.3 21.0 20.8 20.5 20.0			3X 22.5 22.0 21.6 21.1 20.7		
4X 42.0 42.0 42.0 42.0 42.0			4X 42.0 42.0 42.0 42.0 42.0			4X 19.6 19.2 18.8 18.4 18.1			4X 20.4 20.0 19.7 19.4 19.1		
5X 42.0 42.0 42.0 42.0 42.0			5X 42.0 42.0 42.0 42.0 42.0			5X 17.8 17.6 17.3 17.1 16.9			5X 18.0 18.6 18.4 18.2 18.0		
6X 42.0 42.0 42.0 42.0 42.0			6X 42.0 42.0 42.0 42.0 42.0			6X 16.8 16.6 16.5 16.3 16.2			5X 17.0 17.6 17.4 17.2 17.1		
7X 42.0 42.0 42.0 42.0 42.0			7X 42.0 42.0 42.0 42.0 42.0			7X 16.1 15.9 15.7 15.6 15.4			6X 16.9 16.7 16.6 16.4 16.2		
8X 42.0 42.0 42.0 42.0 42.0			8X 42.0 42.0 42.0 42.0 42.0			8X 15.2 15.1 14.9 14.8 14.7			7X 16.0 15.8 15.6 15.3 15.1		
9X 42.0 42.0 42.0 42.0 42.0			9X 42.0 42.0 42.0 42.0 42.0			9X 14.6 14.5 14.3 13.9 13.4			8X 14.8 14.6 14.3 14.0 13.6		
10X 26.5			10X 23.5			10X 13.0			9X 13.1 12.3 4.5 2.3 1.6		
PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE			PERCENT TOTAL DISTANCE		
X=0	2	4	X=0	2	4	X=0	2	4	X=0	2	4
1X 42.0 42.0 42.0 42.0 42.0			1X 39.3 39.3 39.3 39.3 39.3			1X 27.0 27.0 27.0 26.0 25.0			1X 41.0 34.6 32.0 30.5 29.5		
2X 42.0 42.0 42.0 42.0 42.0			2X 39.3 39.3 39.3 39.3 39.3			2X 25.1 24.7 24.6 24.3 24.1			2X 26.8 26.2 27.7 27.2 26.8		
3X 42.0 42.0 42.0 42.0 42.0			3X 39.3 39.3 39.3 39.3 39.3			3X 23.9 23.7 23.6 23.1 22.5			3X 26.4 26.0 25.6 25.1 24.7		
4X 42.0 42.0 42.0 42.0 42.0			4X 37.9 37.9 37.9 37.9 37.9			4X 22.1 21.6 21.5 21.2 20.7			4X 24.7 23.7 23.2 22.8 22.4		
5X 42.0 42.0 42.0 42.0 42.0			5X 36.3 36.1 35.8 35.6 35.3			5X 19.2 19.7 19.3 18.9 18.5			5X 22.0 21.6 21.2 20.8 20.4		
6X 42.0 42.0 42.0 42.0 42.0			6X 35.1 34.8 34.5 34.1 33.6			6X 17.1 16.9 16.7 16.6 16.5			5X 20.1 19.8 19.5 19.2 18.9		
7X 42.0 42.0 42.0 42.0 42.0			7X 33.0 32.5 31.8 31.1 30.3			7X 16.3 16.2 16.0 15.8 15.6			6X 18.7 18.4 18.2 18.0 17.7		
8X 42.0 42.0 42.0 42.0 42.0			8X 29.6 28.4 27.9 27.0 26.1			8X 15.4 15.3 15.1 15.0 14.9			7X 17.4 17.2 16.9 16.6 16.3		
9X 31.8 30.6 29.9 29.0 27.8			9X 25.2 24.3 23.6 22.7 21.6			9X 14.7 14.6 14.4 14.1 13.6			8X 16.0 15.6 15.3 14.9 14.5		
10X 26.6			10X 28.0			10X 13.1			9X 13.9 13.1 4.5 2.4 1.6		

Table B3
Speed Profile for M109A1, 155mm, Self-Propelled Howitzer
for HIMO West Germany Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.8	31.6	30.8	30.5	1X 31.8	30.3	27.9	26.5
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 29.3	28.2	27.4	26.7	1X 25.3	25.0	24.7	24.3
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	31.9	2X 25.8	25.4	24.9	24.5	2X 24.0	23.8	23.5	23.2
3X 32.0	32.0	32.0	32.0	3X 31.8	31.5	31.2	30.9	3X 21.8	21.3	21.0	20.5	3X 22.6	22.3	22.0	21.7
4X 32.0	32.0	32.0	32.0	4X 30.2	29.9	29.6	29.3	4X 21.6	21.3	21.0	20.7	4X 21.0	20.7	20.4	20.1
5X 31.9	31.9	31.8	31.6	5X 28.8	28.6	28.4	28.2	5X 20.2	20.0	19.8	19.7	5X 19.6	19.4	19.2	19.0
6X 31.1	30.8	30.5	30.3	6X 27.8	27.6	27.4	27.2	6X 19.3	19.2	19.0	18.8	6X 18.5	18.3	18.0	17.7
7X 29.8	29.6	29.5	29.3	7X 26.8	26.6	26.3	26.0	7X 18.4	18.3	18.1	18.0	7X 17.2	16.8	16.5	16.2
8X 28.8	28.5	28.2	27.8	8X 25.4	25.1	24.8	24.4	8X 17.7	17.6	17.5	17.4	8X 15.4	15.1	14.7	14.4
9X 26.8	26.4	26.0	25.5	9X 23.6	23.3	22.8	22.5	9X 17.2	17.0	16.7	16.1	9X 13.5	13.0	12.4	11.6
10X 24.1				10X 21.3				10X 14.8				10X 6.5			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 31.1	26.2	26.2	24.4
1X 32.0	32.0	32.0	32.0	1X 24.4	23.9	23.5	23.0
2X 32.0	32.0	32.0	31.9	2X 22.2	21.9	21.5	21.2
3X 31.8	31.5	31.2	30.6	3X 20.6	20.3	20.0	19.5
4X 30.2	29.9	29.6	29.0	4X 19.3	19.1	18.9	18.6
5X 28.8	28.6	28.4	28.0	5X 18.4	18.3	18.2	18.0
6X 27.8	27.6	27.4	27.0	6X 17.6	17.5	17.4	17.1
7X 26.8	26.6	26.3	25.7	7X 17.0	16.9	16.8	16.6
8X 25.4	25.1	24.8	24.4	8X 16.4	16.3	16.2	16.0
9X 23.6	23.3	22.8	22.5	9X 15.8	15.6	15.3	14.9
10X 21.3				10X 13.8			

Snow Condition			
PERCENT TOTAL DISTANCE			
X=0	2	4	H
1X 32.0	32.0	32.0	32.0
1X 32.0	32.0	32.0	32.0
2X 32.0	32.0	32.0	32.0
3X 32.0	32.0	32.0	31.9
4X 31.9	31.8	31.5	31.2
5X 30.6	30.3	30.1	29.8
6X 29.3	29.1	28.9	28.6
7X 27.9	27.4	26.9	26.5
8X 25.6	25.0	24.4	23.1
9X 22.4	21.8	21.2	20.6
10X 18.9			

Table B4
Speed Profile for HMO, 17mm, Self-Propelled Howitzer
for HMO West Germany Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
x=0	2	4	6	x=0	2	4	6	x=0	2	4	6	x=0	2	4	6
1A 32.0	32.0	32.0	32.0	1A 32.0	32.0	32.0	32.0	1A 31.0	31.0	30.0	30.0	1A 31.0	29.4	27.2	26.0
2A 32.0	32.0	32.0	32.0	2A 32.0	32.0	32.0	32.0	2A 29.0	28.0	27.2	26.0	2A 25.0	24.7	24.5	24.0
3A 32.0	32.0	32.0	32.0	3A 31.0	31.0	31.0	31.0	3A 25.6	25.2	24.7	24.3	3A 22.2	21.9	21.6	21.0
4A 32.0	32.0	32.0	32.0	4A 30.1	29.8	29.5	29.2	4A 21.5	21.2	20.9	20.6	4A 20.6	20.3	20.1	19.8
5A 31.0	31.0	31.0	31.0	5A 28.7	28.5	28.2	27.8	5A 20.1	19.9	19.8	19.6	5A 19.3	19.1	18.9	18.5
6A 31.0	31.0	31.0	31.0	6A 27.6	27.4	27.2	26.8	6A 19.2	19.1	18.9	18.7	6A 18.2	18.0	17.8	17.5
7A 29.8	29.6	29.4	29.2	7A 26.5	26.2	25.9	25.4	7A 18.4	18.2	18.1	17.9	7A 16.9	16.6	16.5	15.6
8A 28.8	28.5	28.2	27.8	8A 25.0	24.7	24.4	23.7	8A 17.7	17.6	17.5	17.4	8A 15.2	14.9	14.5	13.8
9A 26.8	26.4	25.9	25.5	9A 23.3	23.0	22.6	22.1	9A 17.1	16.9	16.6	16.1	9A 13.3	12.7	12.0	11.2
10A 24.1				10A 21.0				10A 14.8				10A 4.1			7.8

Wet Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
x=0	2	4	6	x=0	2	4	6
1A 32.0	32.0	32.0	32.0	1A 32.0	32.0	32.0	32.0
2A 32.0	32.0	32.0	32.0	2A 32.0	32.0	32.0	32.0
3A 32.0	32.0	32.0	32.0	3A 32.0	32.0	32.0	32.0
4A 32.0	32.0	32.0	32.0	4A 31.0	31.0	31.0	31.0
5A 31.0	31.0	31.0	31.0	5A 30.4	30.1	29.9	29.6
6A 31.0	31.0	31.0	31.0	6A 29.1	28.9	28.7	28.4
7A 29.8	29.6	29.4	29.2	7A 27.7	27.5	27.3	27.0
8A 28.8	28.5	28.2	27.8	8A 26.4	26.2	26.0	25.7
9A 26.8	26.4	25.9	25.5	9A 25.4	25.2	25.0	24.7
10A 24.1				10A 24.3	24.1	23.9	23.6

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
x=0	2	4	6	x=0	2	4	6
1A 32.0	32.0	32.0	32.0	1A 31.1	30.8	30.5	30.2
2A 32.0	32.0	32.0	32.0	2A 29.1	28.8	28.5	28.2
3A 32.0	32.0	32.0	32.0	3A 28.4	28.1	27.8	27.5
4A 32.0	32.0	32.0	32.0	4A 27.5	27.2	26.9	26.6
5A 31.0	31.0	31.0	31.0	5A 26.2	25.9	25.6	25.3
6A 31.0	31.0	31.0	31.0	6A 24.7	24.4	24.1	23.8
7A 29.8	29.6	29.4	29.2	7A 22.8	22.6	22.4	22.2
8A 28.8	28.5	28.2	27.8	8A 21.0	20.8	20.6	20.4
9A 26.8	26.4	25.9	25.5	9A 19.1	18.9	18.7	18.5
10A 24.1				10A 17.5	17.3	17.1	16.9

Snow Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
x=0	2	4	6	x=0	2	4	6
1A 32.0	32.0	32.0	32.0	1A 31.1	30.8	30.5	30.2
2A 32.0	32.0	32.0	32.0	2A 29.1	28.8	28.5	28.2
3A 32.0	32.0	32.0	32.0	3A 28.4	28.1	27.8	27.5
4A 32.0	32.0	32.0	32.0	4A 27.5	27.2	26.9	26.6
5A 31.0	31.0	31.0	31.0	5A 26.2	25.9	25.6	25.3
6A 31.0	31.0	31.0	31.0	6A 24.7	24.4	24.1	23.8
7A 29.8	29.6	29.4	29.2	7A 22.8	22.6	22.4	22.2
8A 28.8	28.5	28.2	27.8	8A 21.0	20.8	20.6	20.4
9A 26.8	26.4	25.9	25.5	9A 19.1	18.9	18.7	18.5
10A 24.1				10A 17.5	17.3	17.1	16.9

Table B5
Speed Profile for M10E2, 8 in., Self-Propelled Howitzer
for HIMO West Germany Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.0	31.0	30.8	30.5	1X 31.0	29.4	27.2	26.0
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 29.0	28.0	27.2	26.6	1X 25.0	24.7	24.5	24.0
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 25.6	25.2	24.7	24.3	2X 23.8	23.5	23.2	22.6
3X 32.0	32.0	32.0	32.0	3X 31.4	31.4	31.1	30.8	3X 23.6	23.3	22.9	22.4	3X 22.2	21.9	21.6	21.0
4X 32.0	32.0	32.0	32.0	4X 30.1	29.8	29.5	29.2	4X 21.5	21.2	20.9	20.6	4X 20.6	20.3	20.1	19.6
5X 31.9	31.9	31.8	31.6	5X 28.7	28.5	28.2	27.8	5X 20.1	19.9	19.8	19.4	5X 19.3	19.1	18.9	18.6
6X 31.0	30.7	30.5	30.2	6X 27.6	27.4	27.2	26.8	6X 19.2	19.1	18.9	18.6	6X 18.2	18.0	17.7	17.2
7X 29.8	29.6	29.4	29.1	7X 26.5	26.2	25.9	25.4	7X 18.4	18.2	18.1	17.8	7X 16.9	16.6	16.3	15.9
8X 28.8	28.5	28.2	27.8	8X 25.0	24.7	24.4	24.1	8X 17.7	17.6	17.5	17.4	8X 15.2	14.8	14.5	14.1
9X 26.8	26.4	25.9	25.5	9X 23.3	23.0	22.6	22.2	9X 17.1	16.9	16.6	16.1	9X 13.2	12.7	12.1	11.2
10X 24.1				10X 21.0				10X 14.8				10X 4.0			

Wet Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 31.1	28.1	26.1	25.2
1X 32.0	32.0	32.0	32.0	1X 24.3	23.7	23.3	22.8
2X 32.0	32.0	32.0	32.0	2X 22.1	21.7	21.3	21.0
3X 32.0	32.0	32.0	32.0	3X 20.4	20.1	19.8	19.6
4X 32.0	32.0	32.0	32.0	4X 19.1	19.0	18.8	18.5
5X 31.9	31.8	31.6	31.3	5X 18.3	18.1	18.0	17.7
6X 31.0	30.7	30.5	30.2	6X 17.5	17.4	17.2	17.0
7X 29.8	29.6	29.4	29.1	7X 16.9	16.8	16.7	16.4
8X 28.8	28.5	28.2	27.8	8X 16.3	16.2	16.0	15.8
9X 26.8	26.4	25.9	25.5	9X 15.6	15.5	15.2	14.8
10X 24.1				10X 13.7			

Dry Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0
5X 31.9	31.8	31.6	31.3	5X 32.0	32.0	32.0	32.0
6X 31.0	30.7	30.5	30.2	6X 32.0	32.0	32.0	32.0
7X 29.8	29.6	29.4	29.1	7X 32.0	32.0	32.0	32.0
8X 28.8	28.5	28.2	27.8	8X 32.0	32.0	32.0	32.0
9X 26.8	26.4	25.9	25.5	9X 32.0	32.0	32.0	32.0
10X 24.1				10X 32.0	32.0	32.0	32.0

Table B6

Off Road

Trails

Secondary Roads

Primary Roads

Table B7

Primary Roads

Table B8

Speed Profile for OSRS, Ground Support Rocket System
for HIMO West Germany Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
X 41.0	41.0	41.0	41.0	X 41.0	41.0	41.0	41.0	X 36.0	36.0	36.0	36.0	X 40.8	40.8	39.5	38.2
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 32.7	31.0	31.4	31.0	1X 37.7	37.2	36.7	36.3
2X 41.0	41.0	41.0	41.0	2X 41.0	41.0	41.0	41.0	2X 30.2	30.0	29.3	28.0	2X 35.4	34.9	34.3	33.7
3X 41.0	41.0	41.0	41.0	3X 41.0	41.0	41.0	40.9	3X 27.5	27.1	26.7	26.6	3X 32.6	32.0	31.4	30.8
4X 41.0	41.0	41.0	41.0	4X 40.8	41.0	40.5	40.3	4X 25.0	24.4	24.0	23.5	4X 29.8	29.3	28.8	28.4
5X 41.0	41.0	41.0	41.0	5X 40.1	39.9	39.7	39.2	5X 22.8	22.5	22.3	21.8	5X 27.4	27.0	26.6	26.2
6X 41.0	41.0	41.0	41.0	6X 39.0	38.8	38.6	38.0	6X 21.6	21.4	21.2	21.0	6X 25.3	24.9	24.5	24.1
7X 40.5	40.7	40.6	40.5	7X 37.6	37.2	36.6	36.1	7X 20.7	20.4	20.2	20.0	7X 23.4	23.1	22.7	22.5
8X 36.1	37.3	36.5	35.6	8X 35.0	34.3	33.5	32.7	8X 19.6	19.4	19.3	19.1	8X 21.8	21.3	20.9	20.3
9X 33.6	32.7	31.9	31.1	9X 31.0	30.2	29.4	28.5	9X 18.6	18.7	18.3	17.6	9X 18.7	17.6	15.9	14.0
10X 28.8				10X 26.3				10X 16.0				10X 2.6			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
X 41.0	41.0	41.0	41.0	X 41.0	41.0	41.0	41.0	X 36.0	35.9	35.2	33.7	X 36.5	33.6	32.7	31.0
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 31.5	30.9	30.4	29.0	1X 30.2	29.4	28.7	28.1
2X 41.0	41.0	41.0	41.0	2X 41.0	41.0	41.0	41.0	2X 29.0	28.7	28.1	27.5	2X 27.0	26.5	26.0	25.5
3X 41.0	41.0	41.0	41.0	3X 41.0	41.0	40.9	40.9	3X 26.6	26.3	26.0	25.4	3X 24.5	24.1	23.7	23.2
4X 41.0	41.0	41.0	41.0	4X 40.8	40.7	40.6	40.4	4X 24.3	23.8	23.4	23.0	4X 22.4	22.0	21.6	21.3
5X 41.0	41.0	41.0	41.0	5X 40.1	39.9	39.7	39.2	5X 22.4	22.1	21.9	21.6	5X 20.7	20.4	20.2	19.9
6X 40.7	40.6	40.6	40.5	6X 39.0	38.7	38.4	38.1	6X 21.2	21.1	20.9	20.8	6X 19.5	19.3	19.1	18.9
7X 40.3	39.9	39.4	38.8	7X 37.3	36.8	36.2	35.6	7X 20.3	20.1	19.9	19.7	7X 18.5	18.3	18.1	17.9
8X 37.1	36.1	35.2	34.2	8X 34.3	33.5	32.6	31.8	8X 19.3	19.2	19.0	18.9	8X 17.3	17.0	16.6	16.2
9X 32.1	31.1	30.3	29.4	9X 29.9	29.0	28.2	27.3	9X 18.6	18.5	18.1	17.4	9X 15.0	14.0	12.3	4.3
10X 27.0				10X 25.1				10X 15.8				10X 1.6			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
X 41.0	41.0	41.0	41.0	X 39.3	39.3	39.3	39.3	X 36.0	36.0	36.0	36.0	X 40.8	34.9	37.1	36.0
1X 41.0	41.0	41.0	41.0	1X 39.3	39.3	39.3	39.3	1X 33.1	32.2	31.6	31.2	1X 34.4	33.8	33.1	32.4
2X 41.0	41.0	41.0	41.0	2X 39.3	39.3	39.3	39.3	2X 30.6	30.3	29.6	28.9	2X 31.3	30.8	30.4	29.9
3X 41.0	41.0	41.0	41.0	3X 39.3	39.3	39.3	39.3	3X 27.8	27.3	26.9	26.5	3X 28.9	28.4	27.9	27.3
4X 41.0	41.0	41.0	41.0	4X 39.3	39.3	39.3	39.2	4X 25.2	24.6	24.2	23.7	4X 26.3	25.8	25.4	24.9
5X 41.0	41.0	41.0	41.0	5X 39.2	39.2	39.1	39.0	5X 23.0	22.7	22.4	22.2	5X 24.1	23.8	23.4	23.0
6X 40.9	40.9	40.9	40.9	6X 38.7	38.4	38.1	37.7	6X 21.7	21.5	21.3	21.2	6X 22.2	21.9	21.4	21.1
7X 40.6	40.1	39.5	38.9	7X 36.5	35.7	34.8	33.9	7X 20.8	20.5	20.3	20.1	7X 20.3	20.0	19.7	19.4
8X 37.0	35.9	34.9	33.9	8X 32.0	31.0	29.9	29.0	8X 19.7	19.5	19.3	19.2	8X 18.4	18.0	17.5	16.8
9X 31.6	30.6	29.8	28.8	9X 26.7	25.8	24.0	23.9	9X 18.9	18.7	18.3	17.6	9X 16.1	14.6	8.3	3.1
10X 26.4				10X 21.6				10X 16.0				10X 1.4			

Table B9

[illegible]

Table B10

Speed Profile for M578 Towing M107
for HIMO West Germany Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M	X=0	2	4	M	X=0	2	4	M
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0
10X 9.7				10X 9.2				10X 8.7				10X 1.5			

Wet Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 9.8	9.8	9.8	9.8	9X 9.5	9.4	9.4	9.3
10X 9.7				10X 9.2			

Dry Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 9.6	9.6	9.6	9.6	9X 9.4	9.3	9.3	9.2
10X 9.2				10X 9.1			

Dry Condition				Snow Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 9.5	9.5	9.4	9.4	9X 9.4	9.3	9.3	9.2
10X 9.2				10X 9.1			

Table B11

[illegible]

Table B12

[illegible]

Table B13

[illegible]

Speed Profile for M578 Towing OSRS
for HIMO West Germany Study Area

[illegible]

Table B15

[illegible]

Table B16

[illegible]

Table B17

Primary Roads

Secondary Roads

Trails

Off Road

Dry Condition

Wet Condition

Snow Condition

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 10.0

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 9.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 9.9 9.4 9.4
10X 9.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 9.6 9.6 9.7 9.7 9.6
8X 9.6 9.6 9.7 9.7 9.6
9X 9.0 8.9 8.7 8.0 3.4
10X 2.0

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 10.0

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 9.9

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 9.9 9.9
9X 9.9 9.9 9.8 9.7 9.5
10X 9.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 9.9 9.9 9.9
4X 9.9 9.9 9.9 9.9 9.9
5X 9.8 9.8 9.8 9.7 9.7
6X 9.7 9.6 9.6 9.5 9.5
7X 9.4 9.4 9.4 9.2 9.2
8X 9.1 9.6 8.9 8.8 8.6
9X 8.5 8.3 8.1 6.4 2.9
10X 1.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 10.0

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 10.0 10.0 10.0 10.0
10X 9.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 10.0 10.0 10.0 10.0
7X 10.0 10.0 10.0 10.0 10.0
8X 10.0 10.0 10.0 10.0 10.0
9X 10.0 9.9 9.8 9.8 9.6
10X 9.4

PERCENT TOTAL DISTANCE

X=H 2 4
1X 10.0 10.0 10.0 10.0 10.0
1X 10.0 10.0 10.0 10.0 10.0
2X 10.0 10.0 10.0 10.0 10.0
3X 10.0 10.0 10.0 10.0 10.0
4X 10.0 10.0 10.0 10.0 10.0
5X 10.0 10.0 10.0 10.0 10.0
6X 10.0 9.9 9.9 9.9 9.8
7X 9.8 9.7 9.7 9.6 9.5
8X 9.4 9.4 9.3 9.1 9.0
9X 8.8 8.6 8.4 5.7 2.7
10X 1.4

Table B18

Speed Profile for M88 Towing GSRS
for HIMO West Germany Study Area

[illegible]

Table B19
Speed Profile for M578 Light Recovery Vehicle
for HIMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 34.0	34.0	34.0	34.0	1X 34.0	34.0	34.0	34.0	1X 33.8	33.5	32.1	31.4	1X 33.8	33.8	33.8	33.8
2X 34.0	34.0	34.0	34.0	2X 34.0	34.0	34.0	34.0	2X 30.6	30.0	29.6	29.2	2X 33.4	32.9	32.1	31.5
3X 34.0	34.0	34.0	34.0	3X 34.0	34.0	34.0	34.0	3X 27.6	27.2	26.5	25.9	3X 29.9	28.7	27.4	26.5
4X 34.0	34.0	34.0	34.0	4X 34.0	34.0	34.0	34.0	4X 24.9	24.6	24.0	23.7	4X 24.8	24.0	23.4	22.8
5X 34.0	34.0	34.0	34.0	5X 34.0	34.0	34.0	34.0	5X 23.3	23.0	22.5	22.1	5X 21.9	21.5	21.1	20.7
6X 33.9	33.9	33.9	33.9	6X 33.9	33.9	33.9	33.9	6X 21.5	21.2	20.9	20.7	6X 20.1	19.8	19.5	19.2
7X 33.7	33.6	33.5	33.4	7X 32.7	32.5	32.2	31.9	7X 19.5	19.3	19.2	19.0	7X 17.3	17.0	16.8	16.5
8X 33.3	33.3	33.2	33.1	8X 31.0	30.1	29.3	28.6	8X 18.7	18.5	18.4	18.1	8X 16.0	15.8	15.5	15.3
9X 33.0	33.0	32.9	32.8	9X 27.3	26.7	26.2	25.7	9X 17.9	17.7	17.5	17.3	9X 7.0	2.8	1.8	1.3
10X 27.0				10X 24.7				10X 16.4				10X 0.9			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 34.0	34.0	34.0	34.0	1X 34.0	34.0	34.0	34.0	1X 28.8	28.8	28.7	28.7	1X 26.9	26.3	22.6	21.5
2X 34.0	34.0	34.0	34.0	2X 34.0	34.0	34.0	34.0	2X 26.6	25.7	25.0	24.5	2X 19.8	19.0	18.4	17.9
3X 34.0	34.0	34.0	34.0	3X 34.0	34.0	34.0	34.0	3X 23.8	23.4	23.1	22.9	3X 17.3	17.1	16.9	16.7
4X 34.0	34.0	34.0	34.0	4X 34.0	34.0	34.0	34.0	4X 22.2	21.9	21.6	21.4	4X 16.4	16.3	16.2	16.1
5X 34.0	34.0	34.0	34.0	5X 34.0	34.0	34.0	34.0	5X 20.8	20.6	20.3	20.1	5X 15.9	15.7	15.6	15.5
6X 33.9	33.9	33.8	33.7	6X 33.9	33.9	33.8	33.7	6X 19.7	19.5	19.3	19.2	6X 15.2	15.1	14.9	14.8
7X 33.5	33.5	33.4	33.3	7X 32.3	32.1	31.7	31.5	7X 18.8	18.7	18.5	18.4	7X 14.4	14.3	14.1	14.0
8X 32.9	32.8	32.7	32.6	8X 30.5	29.3	28.4	27.6	8X 17.5	17.4	17.3	17.1	8X 13.7	13.6	13.4	13.3
9X 32.6	32.5	32.4	32.3	9X 26.3	25.7	25.1	24.6	9X 16.9	16.7	16.5	16.3	9X 6.3	2.7	1.7	1.3
10X 25.0				10X 23.5				10X 15.5				10X 0.9			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 34.0	34.0	34.0	34.0	1X 34.0	34.0	34.0	34.0	1X 14.7	14.7	14.6	14.5	1X 14.7	14.7	14.7	14.5
2X 34.0	34.0	34.0	34.0	2X 34.0	34.0	34.0	34.0	2X 14.5	14.5	14.4	14.4	2X 14.2	14.0	13.8	13.5
3X 34.0	34.0	34.0	34.0	3X 34.0	34.0	34.0	34.0	3X 14.4	14.3	14.2	14.1	3X 13.4	13.3	13.1	12.8
4X 34.0	34.0	34.0	34.0	4X 34.0	34.0	34.0	34.0	4X 13.9	13.8	13.7	13.6	4X 12.7	12.6	12.5	12.3
5X 34.0	34.0	34.0	34.0	5X 34.0	34.0	34.0	34.0	5X 13.5	13.4	13.3	13.2	5X 12.1	12.0	11.9	11.7
6X 33.9	33.9	33.8	33.7	6X 33.5	33.3	33.1	32.8	6X 13.1	13.0	12.9	12.8	6X 11.6	11.5	11.4	11.3
7X 33.3	33.3	33.2	33.1	7X 32.3	32.1	31.7	31.5	7X 12.7	12.7	12.6	12.5	7X 11.1	11.0	10.8	10.7
8X 32.9	32.8	32.7	32.6	8X 30.5	29.3	28.4	27.6	8X 12.4	12.4	12.3	12.2	8X 10.5	10.3	10.1	9.8
9X 31.9	31.8	31.7	31.6	9X 26.3	25.7	25.1	24.6	9X 12.1	12.0	11.9	11.8	9X 9.7	9.5	9.3	9.0
10X 25.0				10X 23.5				10X 11.5	11.3	11.0	10.8	10X 5.3	2.5	1.6	1.2

Table B20

Off Road

Table B21

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.9	31.9	31.9	31.9	1X 31.9	31.9	31.9	31.9
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.9	31.9	31.9	31.9	1X 31.7	31.4	31.0	30.7
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 27.2	26.7	26.1	25.5	2X 29.3	28.2	27.0	26.0
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0	3X 24.6	24.3	24.0	23.7	3X 24.5	23.9	23.1	22.8
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0	4X 23.0	22.7	22.3	21.9	4X 21.9	21.4	21.1	20.8
5X 32.0	32.0	32.0	32.0	5X 32.0	32.0	32.0	32.0	5X 21.3	21.0	20.6	20.2	5X 20.2	19.9	19.5	19.3
6X 32.0	32.0	32.0	32.0	6X 32.0	32.0	32.0	32.0	6X 20.2	20.0	19.9	19.7	6X 18.4	18.4	18.1	17.7
7X 31.8	31.8	31.8	31.8	7X 31.2	31.0	30.8	30.6	7X 19.4	19.3	19.1	19.0	7X 17.1	16.8	16.4	15.9
8X 31.6	31.4	31.1	31.0	8X 18.6	18.5	18.3	18.1	8X 18.6	18.5	18.3	18.2	8X 14.8	14.2	13.6	13.0
9X 30.7	30.1	28.9	27.8	9X 17.9	17.8	17.6	17.4	9X 17.9	17.8	17.6	17.4	9X 11.9	11.4	10.6	9.9
10X 26.0				10X 16.5				10X 8.7				10X 6.2			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 29.3	29.3	29.3	29.3	1X 24.4	22.7	21.6	20.4
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 26.3	25.6	25.2	24.8	1X 19.7	18.9	18.4	18.0
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 23.9	23.4	23.0	22.7	2X 17.4	17.2	17.0	16.9
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0	3X 22.0	21.7	21.5	21.3	3X 16.6	16.4	16.3	16.2
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0	4X 20.7	20.4	20.2	20.0	4X 16.0	15.9	15.7	15.6
5X 32.0	32.0	32.0	32.0	5X 32.0	32.0	32.0	32.0	5X 19.6	19.4	19.2	19.1	5X 15.2	15.0	14.8	14.4
6X 31.8	31.7	31.6	31.4	6X 18.8	18.7	18.6	18.5	6X 18.8	18.7	18.6	18.5	6X 14.2	14.0	13.8	13.4
7X 31.6	31.7	31.5	31.1	7X 18.2	18.0	17.9	17.8	7X 13.2	13.1	12.9	12.6	7X 13.2	13.1	12.9	12.5
8X 31.4	31.3	31.1	30.8	8X 17.5	17.4	17.2	17.1	8X 11.9	11.5	11.1	10.7	8X 11.9	11.5	11.1	10.4
9X 30.4	29.6	28.3	27.6	9X 16.8	16.6	16.5	16.3	9X 10.0	9.6	9.1	8.6	9X 10.0	9.6	9.1	

Table B22

Speed Profile for M107, 175mm, Self-Propelled Howitzer
for HIMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.0	31.7	30.8	30.5	1X 31.0	31.4	30.9	30.4
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 30.2	29.3	28.5	28.0	1X 30.1	29.0	28.0	27.4
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 27.0	26.5	25.9	25.3	1X 26.1	25.0	24.0	23.4
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 24.5	24.1	23.9	23.6	1X 24.4	23.7	23.1	22.6
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 22.9	22.6	22.2	21.8	1X 21.7	21.3	20.6	20.3
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 21.2	20.0	20.7	20.4	1X 20.1	19.7	19.4	19.1
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 20.1	19.9	19.4	19.7	1X 18.6	18.3	18.0	17.6
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 19.4	19.2	19.1	18.9	1X 17.0	16.6	16.3	15.8
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 18.6	18.4	18.3	18.2	1X 14.7	14.0	13.4	12.8
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 17.9	17.7	17.5	17.3	1X 11.6	11.0	10.2	9.5
10X 24.0				10X 24.0				10X 16.4				10X 4.2			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 29.2	29.2	29.2	28.2	1X 24.4	22.7	21.6	20.8
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 26.2	26.5	26.1	24.8	1X 19.6	16.8	16.3	17.9
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 23.8	23.3	23.0	22.6	1X 17.4	17.2	17.0	16.8
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 21.9	21.6	21.4	21.1	1X 16.6	16.4	16.3	16.2
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 20.6	20.3	20.1	19.9	1X 15.9	15.8	15.6	15.4
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 19.5	19.3	19.2	19.0	1X 15.1	14.9	14.7	14.5
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 18.7	18.6	18.5	18.4	1X 14.1	13.9	13.7	13.5
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 18.1	17.9	17.8	17.7	1X 13.1	12.9	12.7	12.5
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 17.4	17.3	17.1	17.0	1X 11.0	11.4	11.0	10.6
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 16.7	16.5	16.3	16.1	1X 9.0	9.4	8.8	8.3
10X 23.0				10X 23.0				10X 15.4				10X 3.9			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 14.5	14.5	14.5	14.5	1X 14.5	14.3	14.2	14.1
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 14.2	14.2	14.1	14.0	1X 13.9	13.8	13.7	13.5
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 13.9	13.6	13.4	13.3	1X 12.9	12.8	12.7	12.6
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 13.6	13.5	13.4	13.3	1X 12.4	12.2	12.1	11.9
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 13.2	13.2	13.1	13.0	1X 11.6	11.4	11.2	11.1
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 12.9	12.9	12.8	12.7	1X 10.8	10.6	10.4	10.2
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 12.7	12.6	12.6	12.5	1X 9.7	9.5	9.2	9.0
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 12.3	12.2	12.1	12.0	1X 8.6	8.4	8.2	8.0
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 11.5	11.3	11.0	10.7	1X 7.6	7.3	7.0	6.7
10X 23.0				10X 23.0				10X 10.2				10X 3.6			

Table B23
Speed Profile for M10E2, 8 in., Self-Propelled Howitzer
for HMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 31.9	31.7	30.8	30.5	1X 31.9	31.9	31.8	31.8
1X 37.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 30.2	29.3	28.5	28.0	1X 31.7	31.4	30.9	30.5
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 27.0	26.6	25.9	25.3	2X 29.1	28.0	26.9	26.1
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0	3X 24.5	24.1	23.9	23.6	3X 24.4	23.7	23.1	22.6
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0	4X 22.9	22.6	22.2	21.8	4X 21.7	21.3	21.0	20.6
5X 32.0	32.0	32.0	32.0	5X 32.0	32.0	32.0	32.0	5X 21.2	20.9	20.7	20.5	5X 20.1	19.7	19.4	19.1
6X 32.0	32.0	32.0	32.0	6X 32.0	32.0	32.0	32.0	6X 20.1	19.9	19.8	19.7	6X 18.6	18.3	18.0	17.6
7X 31.9	31.9	31.9	31.8	7X 31.2	31.0	30.7	30.5	7X 19.4	19.2	19.1	18.9	7X 17.0	16.6	16.2	15.8
8X 31.8	31.8	31.7	31.7	8X 29.8	29.0	28.2	27.0	8X 18.6	18.4	18.3	18.2	8X 14.6	14.0	13.3	12.7
9X 31.5	31.3	31.2	31.0	9X 26.4	25.9	25.4	24.6	9X 17.9	17.7	17.5	17.3	9X 11.6	11.0	10.2	9.5
10X 25.9				10X 24.0				10X 16.4				10X 5.9			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 29.2	29.2	29.2	28.2	1X 24.4	22.7	21.6	20.8
1X 37.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 26.2	25.5	25.1	24.8	1X 19.6	18.8	18.3	17.9
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 23.8	23.3	23.0	22.6	2X 17.4	17.2	17.0	16.8
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0	3X 21.9	21.6	21.4	21.1	3X 16.6	16.4	16.3	16.2
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0	4X 20.6	20.3	20.1	19.9	4X 15.9	15.8	15.6	15.4
5X 32.0	32.0	32.0	32.0	5X 32.0	32.0	32.0	32.0	5X 19.5	19.3	19.2	19.0	5X 15.1	14.9	14.7	14.5
6X 31.8	31.7	31.6	31.3	6X 31.8	31.7	31.6	31.3	6X 18.7	18.6	18.5	18.4	6X 14.1	13.9	13.7	13.5
7X 31.7	31.7	31.6	31.5	7X 30.9	30.7	30.4	30.1	7X 18.1	17.9	17.8	17.7	7X 13.1	12.9	12.7	12.5
8X 31.3	31.2	31.0	30.9	8X 29.2	28.5	27.5	26.8	8X 17.4	17.3	17.1	17.0	8X 11.4	11.4	11.0	10.1
9X 30.3	29.5	28.2	27.0	9X 25.5	25.0	24.5	23.6	9X 16.7	16.5	16.3	16.1	9X 9.8	9.4	8.8	8.3
10X 24.9				10X 23.0				10X 15.4				10X 5.4			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 32.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 14.5	14.5	14.5	14.5	1X 14.5	14.5	14.5	14.0
1X 37.0	32.0	32.0	32.0	1X 32.0	32.0	32.0	32.0	1X 14.5	14.4	14.4	14.4	1X 13.9	13.8	13.7	13.4
2X 32.0	32.0	32.0	32.0	2X 32.0	32.0	32.0	32.0	2X 14.2	14.2	14.1	14.0	2X 13.3	13.3	13.2	13.0
3X 32.0	32.0	32.0	32.0	3X 32.0	32.0	32.0	32.0	3X 13.9	13.9	13.8	13.7	3X 12.9	12.8	12.7	12.5
4X 32.0	32.0	32.0	32.0	4X 32.0	32.0	32.0	32.0	4X 13.6	13.5	13.4	13.4	4X 12.4	12.2	12.1	11.9
5X 32.0	32.0	32.0	32.0	5X 32.0	32.0	32.0	32.0	5X 13.2	13.2	13.1	13.1	5X 11.6	11.4	11.2	11.1
6X 31.9	31.8	31.8	31.8	6X 31.8	31.7	31.6	31.1	6X 12.9	12.9	12.8	12.7	6X 10.8	10.6	10.4	10.0
7X 31.7	31.7	31.7	31.6	7X 30.9	30.7	30.4	30.1	7X 12.7	12.6	12.6	12.5	7X 9.7	9.4	9.2	8.8
8X 31.3	31.2	31.0	30.9	8X 29.2	28.5	27.5	26.8	8X 12.3	12.2	12.1	12.0	8X 8.6	8.4	8.2	7.8
9X 30.3	29.5	28.2	27.0	9X 25.5	25.0	24.5	23.6	9X 11.5	11.3	11.0	10.7	9X 7.6	7.3	7.0	6.5
10X 24.9				10X 23.0				10X 10.2				10X 4.7			

Speed Profile for M88 Medium Recovery Vehicle
for HIMO Mid-East Study Area

[illegible]

Table B25

Off Road

Trails

Table B26
Speed Profile for GRS, Ground Support Rocket System
for HMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 36.0	36.0	36.0	36.0	1X 40.0	40.0	40.0	40.0
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 33.7	32.7	32.0	31.5	1X 37.5	37.2	37.1	36.7
2X 41.0	41.0	41.0	41.0	2X 41.0	41.0	41.0	41.0	2X 30.8	30.6	30.1	29.4	2X 35.2	34.5	33.5	32.3
3X 41.0	41.0	41.0	41.0	3X 41.0	41.0	41.0	41.0	3X 28.1	27.7	27.3	26.9	3X 30.1	29.2	28.3	27.4
4X 41.0	41.0	41.0	41.0	4X 41.0	41.0	41.0	41.0	4X 26.3	26.1	25.8	25.4	4X 25.9	25.3	24.7	24.2
5X 41.0	41.0	41.0	41.0	5X 41.0	41.0	41.0	41.0	5X 24.5	24.1	23.8	23.4	5X 23.3	22.8	22.2	21.7
6X 41.0	41.0	41.0	41.0	6X 40.9	40.9	40.7	40.4	6X 22.9	22.6	22.4	22.2	6X 21.6	21.3	20.9	20.6
7X 41.0	41.0	41.0	41.0	7X 39.9	39.5	39.0	38.3	7X 21.8	21.6	21.5	21.3	7X 19.9	19.5	19.2	18.8
8X 40.9	40.8	40.6	40.4	8X 36.7	35.3	34.1	33.0	8X 21.0	20.8	20.6	20.4	8X 17.8	17.3	16.7	16.0
9X 39.2	38.0	35.9	34.1	9X 31.1	30.3	29.5	28.8	9X 20.0	19.8	19.7	19.5	9X 14.3	13.5	11.9	10.8
10X 31.1				10X 27.4				10X 18.4				10X 4.4			
Wet Condition				Wet Condition				Wet Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 36.0	36.0	35.6	34.0	1X 39.8	37.6	35.2	31.8
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 31.9	31.2	30.8	30.5	1X 27.9	26.6	25.4	24.2
2X 41.0	41.0	41.0	41.0	2X 41.0	41.0	41.0	41.0	2X 30.0	29.7	29.2	28.6	2X 22.3	21.6	21.1	20.7
3X 41.0	41.0	41.0	41.0	3X 41.0	41.0	41.0	41.0	3X 27.5	27.1	26.7	26.4	3X 19.9	19.6	19.3	19.0
4X 41.0	41.0	41.0	41.0	4X 41.0	41.0	41.0	41.0	4X 25.9	25.6	25.2	24.8	4X 18.5	18.3	18.1	17.9
5X 41.0	41.0	41.0	41.0	5X 41.0	41.0	41.0	41.0	5X 23.9	23.6	23.2	22.9	5X 17.6	17.4	17.3	17.2
6X 41.0	41.0	41.0	41.0	6X 40.9	40.9	40.5	40.1	6X 22.4	22.2	22.0	21.8	6X 16.8	16.7	16.4	16.2
7X 41.0	41.0	41.0	41.0	7X 39.5	38.8	38.2	37.5	7X 21.4	21.3	21.1	21.0	7X 15.8	15.6	15.3	15.1
8X 40.5	40.2	39.9	39.6	8X 35.7	34.2	32.9	31.7	8X 20.7	20.5	20.2	20.1	8X 14.5	14.3	13.9	13.7
9X 38.1	36.7	34.5	32.6	9X 29.7	28.9	28.1	27.4	9X 19.7	19.5	19.4	19.2	9X 12.1	11.5	11.0	10.8
10X 29.4				10X 25.9				10X 18.1				10X 1.3			
Sand Condition				Sand Condition				Sand Condition				Sand Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 27.8	27.7	27.3	27.2	1X 29.6	28.9	28.3	28.1
1X 41.0	41.0	41.0	41.0	1X 41.0	41.0	41.0	41.0	1X 26.1	25.4	24.8	24.3	1X 27.3	26.9	26.4	25.8
2X 41.0	41.0	41.0	41.0	2X 41.0	41.0	41.0	41.0	2X 23.7	23.4	23.1	22.8	2X 24.7	24.2	23.7	23.3
3X 41.0	41.0	41.0	41.0	3X 41.0	41.0	41.0	41.0	3X 22.5	22.1	21.7	21.4	3X 22.2	21.8	21.4	20.9
4X 41.0	41.0	41.0	41.0	4X 41.0	41.0	41.0	41.0	4X 20.9	20.7	20.5	20.3	4X 20.2	19.8	19.5	19.2
5X 41.0	41.0	41.0	41.0	5X 41.0	41.0	41.0	41.0	5X 20.0	19.9	19.7	19.5	5X 18.6	18.3	18.0	17.7
6X 41.0	41.0	41.0	41.0	6X 40.9	40.9	40.5	40.1	6X 19.2	19.1	18.9	18.7	6X 17.1	16.7	16.4	16.0
7X 41.0	41.0	41.0	41.0	7X 39.3	38.8	38.2	37.5	7X 18.4	18.3	18.1	18.0	7X 15.4	15.1	14.7	14.4
8X 40.5	40.2	39.9	39.6	8X 35.7	34.2	32.9	31.7	8X 17.6	17.5	17.3	17.1	8X 13.8	13.4	13.0	12.5
9X 38.1	36.7	34.5	32.6	9X 29.7	28.9	28.1	27.4	9X 16.6	16.4	16.1	15.8	9X 11.4	10.9	10.0	9.2
10X 29.4				10X 25.9				10X 15.0				10X 4.1			

Table B27

[illegible]

Table B29
Speed Profile for M578 Towing M109A1
for HIMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	6	X=0	2	4	6	X=0	2	4	6	X=0	2	4	6
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0
10X 10.0				10X 10.0				10X 10.0				10X 10.0			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	6	X=0	2	4	6
1X 10.0	10.0	10.0	10.0	1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0	2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0	3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0	4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0	5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0	6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0	7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0	8X 10.0	10.0	10.0	10.0
9X 10.0	10.0	10.0	10.0	9X 10.0	10.0	10.0	10.0
10X 10.0				10X 10.0			

Sand Condition			
PERCENT TOTAL DISTANCE			
X=0	2	4	6
1X 10.0	10.0	10.0	10.0
2X 10.0	10.0	10.0	10.0
3X 10.0	10.0	10.0	10.0
4X 10.0	10.0	10.0	10.0
5X 10.0	10.0	10.0	10.0
6X 10.0	10.0	10.0	10.0
7X 10.0	10.0	10.0	10.0
8X 10.0	10.0	10.0	10.0
9X 10.0	10.0	10.0	10.0
10X 10.0			

Table B30

[illegible]

Table B31
Speed Profile for M578 Towing IFV/CVV
for HIMO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H	X=0	2	4	H	X=0	2	4	H
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0			
10X 10.0				10X 10.0				10X 10.0				10X 10.0			

Wet Condition				Sand Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0			
10X 9.9				10X 10.0			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 9.6				9X 9.0			
10X 9.1				10X 8.4			

PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0			
10X 9.9				10X 9.9			

PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	H	X=0	2	4	H
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0			
10X 9.9				10X 9.9			

Table B32
Speed Profile for M576 Towing GSRS
for HINO Mid-East Study Area

Primary Roads				Secondary Roads				Trails				Off Road			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M	X=0	2	4	M	X=0	2	4	M
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0				4X 9.9 9.9 9.9 9.9			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0				5X 9.8 9.8 9.8 9.8			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0				6X 9.6 9.6 9.6 9.6			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0				7X 9.9 9.9 9.9 9.9				7X 9.4 9.4 9.4 9.4			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0				9X 9.8 9.8 9.8 9.8				8X 8.9 8.9 8.9 8.9			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0				9X 9.5 9.5 9.5 9.5				9X 3.5 2.0 1.4 1.1			
10X 10.0				10X 10.0				10X 9.8				10X 8.8			

Wet Condition				Sand Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 10.0 10.0 10.0 10.0			
5X 10.0 10.0 10.0 10.0				5X 10.0 10.0 10.0 10.0			
6X 10.0 10.0 10.0 10.0				6X 10.0 10.0 10.0 10.0			
7X 10.0 10.0 10.0 10.0				7X 10.0 10.0 10.0 10.0			
8X 10.0 10.0 10.0 10.0				8X 10.0 10.0 10.0 10.0			
9X 10.0 10.0 10.0 10.0				9X 10.0 10.0 10.0 10.0			
10X 10.0				10X 10.0			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 9.8 9.8 9.8 9.8			
5X 10.0 10.0 10.0 10.0				5X 9.6 9.6 9.6 9.6			
6X 10.0 10.0 10.0 10.0				6X 9.4 9.4 9.4 9.4			
7X 10.0 10.0 10.0 10.0				7X 9.3 9.3 9.3 9.3			
8X 10.0 10.0 10.0 10.0				8X 9.2 9.2 9.2 9.2			
9X 10.0 10.0 10.0 10.0				9X 8.9 8.9 8.9 8.9			
10X 10.0				10X 7.7			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 9.7 9.7 9.7 9.7			
5X 10.0 10.0 10.0 10.0				5X 9.5 9.5 9.5 9.5			
6X 10.0 10.0 10.0 10.0				6X 9.4 9.4 9.4 9.4			
7X 10.0 10.0 10.0 10.0				7X 9.3 9.3 9.3 9.3			
8X 10.0 10.0 10.0 10.0				8X 9.1 9.1 9.1 9.1			
9X 10.0 10.0 10.0 10.0				9X 8.6 8.6 8.6 8.6			
10X 10.0				10X 7.7			

Dry Condition				Wet Condition			
PERCENT TOTAL DISTANCE				PERCENT TOTAL DISTANCE			
X=0	2	4	M	X=0	2	4	M
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
1X 10.0 10.0 10.0 10.0				1X 10.0 10.0 10.0 10.0			
2X 10.0 10.0 10.0 10.0				2X 10.0 10.0 10.0 10.0			
3X 10.0 10.0 10.0 10.0				3X 10.0 10.0 10.0 10.0			
4X 10.0 10.0 10.0 10.0				4X 7.4 7.4 7.4 7.4			
5X 10.0 10.0 10.0 10.0				5X 7.3 7.3 7.3 7.3			
6X 10.0 10.0 10.0 10.0				6X 6.9 6.9 6.9 6.9			
7X 10.0 10.0 10.0 10.0				7X 6.7 6.7 6.7 6.7			
8X 10.0 10.0 10.0 10.0				8X 6.3 6.3 6.3 6.3			
9X 10.0 10.0 10.0 10.0				9X 3.3 2.0 1.4 1.1			
10X 10.0				10X 0.4			

Table B33

Primary Roads									
Secondary Roads									
Trails									
Off Road									
Dry Condition									
Wet Condition									
Sand Condition									
PERCENT TOTAL DISTANCE									
PERCENT TOTAL DISTANCE									
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Table B34

[illegible]

Table B35

[illegible]

Table B37

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Dry Condition in HIMO West Germany Study Area

Vehicles	Off-Road			
	Insufficient Traction	Obstacle Interference and Traction	Combination of Following: Obstacles, Vegetation, Soil, Slope	Total NOGO
<u>Individual Vehicle Performance</u>				
M578 Light Recovery Vehicle	0	4.9	0.2	5.1
M113A1 Armored Personnel Carrier (APC)	0	7.1	0	7.1
M109A1, 155 mm, Self-Propelled Howitzer	0	0.3	0.2	0.5
M107, 175 mm, Self-Propelled Howitzer	0	2.1	0.2	2.3
M110E2, 8 in., Self-Propelled Howitzer	0	1.3	0.2	1.5
M88 Medium Recovery Vehicle	0	2.2	0.6	2.8
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	2.1	0.2	2.3
GSRS, Ground Support Rocket System	0	2.8	0	2.8
<u>M578/M88 Towing Performance</u>				
M578 Towing M113A1	0	6.3	0.2	6.5
M578 Towing M107	0	5.0	0.2	5.2
M578 Towing M109A1	0	5.6	0.2	5.8
M578 Towing M110E2	0	5.7	0.2	5.9
M578 Towing IFV/CFV	0	5.2	0.2	5.4
M578 Towing GSRS	0	5.5	0.2	5.7
M88 Towing M107	0	3.4	0.6	4.0
M88 Towing M110E2	0	3.9	0.6	4.5
M88 Towing IFV/CFV	0	2.9	0.6	3.5
M88 Towing GSRS	0	4.2	0.6	4.8

Note: No NOGO's on trails.

Table B38

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Wet Condition in HIMO West Germany Study Area

Vehicles	Off-Road			
	Insufficient Traction	Obstacle Interference and Traction	Combination of Following: Obstacles, Vegetation, Soil, Slope	Total NOGO
<u>Individual Vehicle Performance</u>				
M578 Light Recovery Vehicle	0	5.0	0.2	5.2
M113A1 Armored Personnel Carrier (APC)	0	7.3	0	7.3
M109A1, 155 mm, Self-Propelled Howitzer	0	1.1	0.2	1.3
M107, 175 mm, Self-Propelled Howitzer	0	2.6	0.2	2.8
M110E2, 8 in., Self-Propelled Howitzer	0	1.7	0.2	1.9
M88 Medium Recovery Vehicle	0	2.2	0.6	2.8
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	5.3	0.2	5.5
GSRS, Ground Support Rocket System	0	5.1	0.0	5.1
<u>M578/M88 Towing Performance</u>				
M578 Towing M113A1	0	6.3	0.2	6.5
M578 Towing M107	0	5.5	0.4	5.9
M578 Towing M109A1	0	5.8	0.2	6.0
M578 Towing M110E2	0	6.3	0.4	6.7
M578 Towing IFV/CFV	0	5.8	0.2	6.0
M578 Towing GSRS	0	5.9	0.2	6.1
M88 Towing M107	0	3.9	0.6	4.5
M88 Towing M110E2	0	3.5	0.6	4.1
M88 Towing IFV/CFV	0	3.3	0.6	3.9
M88 Towing GSRS	0	4.2	0.6	4.8

Note: No NOGO's on trails.

Table B39

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Snow Condition in HIMO West Germany Study Area

Vehicles	Trails		Off-Road			
	Insufficient Traction	Total NOGO	Insufficient Traction	Obstacle Interference & Traction	Combination of Following: Obstacle, Vegetation, Soil & Slope	Total NOGO
<u>Individual Vehicle Performance</u>						
M578 Light Recovery Vehicle	0	0	0	5.0	0.2	5.2
M113A1 Armored Personnel Carrier (APC)	0	0	0	7.3	0	7.3
M109A1, 155 mm, Self-Propelled Howitzer	0	0	0	2.5	0.2	2.7
M107, 175 mm, Self-Propelled Howitzer	0	0	0	3.2	0.2	3.4
M110E2, 8 in., Self-Propelled Howitzer	0	0	0	2.6	0.2	2.8
M88 Medium Recovery Vehicle	0	0	0	2.2	0.6	2.8
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	0	0	5.7	0.2	5.9
GSRS, Ground Support Rocket System	0	0	0	6.1	0.4	6.5
<u>M578/M88 Towing Performance</u>						
M578 Towing M113A1	0	0	0	6.3	0.2	6.5
M578 Towing M107	0.5	0.5	2.1	5.5	2.4	10.0
M578 Towing M109A1	0	0	0	5.7	0.7	6.4
M578 Towing M110E2	0.5	0.5	2.1	6.2	2.4	10.7
M578 Towing IFV/CFV	0	0	0	5.4	0.3	5.7
M578 Towing GSRS	0	0	0	5.8	0.7	6.5
M88 Towing M107	0	0	0	3.4	0.6	4.0
M88 Towing M110E2	0	0	0	3.6	0.6	4.2
M88 Towing IFV/CFV	0	0	0	3.6	0.6	4.2
M88 Towing GSRS	0	0	0	4.4	0.6	5.0

Table B40

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Dry Condition in HIMO Mid-East Study Area

Vehicles	Off-Road			
	Insufficient Traction	Obstacle Interference and Traction	Combination of Following: Obstacles, Vegetation, Soil, Slope	Total NOGO
<u>Individual Vehicle Performance</u>				
M578 Light Recovery Vehicle	0	10.7	0	10.7
M113A1 Armored Personnel Carrier (APC)	0	9.4	0	9.4
M109A1, 155 mm, Self-Propelled Howitzer	0	0	0	0
M107, 175 mm, Self-Propelled Howitzer	0	1.3	0	1.3
M110E2, 8 in., Self-Propelled Howitzer	0	0.5	0	0.5
M88 Medium Recovery Vehicle	0	0.5	0	0.5
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	1.3	0	1.3
GSRS, Ground Support Rocket System	0	1.3	0	1.3
<u>M578/M88 Towing Performance</u>				
M578 Towing M113A1	0	11.1	0	11.1
M578 Towing M107	0	11.5	0	11.5
M578 Towing M109A1	0	11.5	0	11.5
M578 Towing M110E2	0	11.5	0	11.5
M578 Towing IFV/CFV	0	11.3	0	11.3
M578 Towing GSRS	0	11.5	0	11.5
M88 Towing M107	0	5.9	0	5.9
M88 Towing M110E2	0	5.9	0	5.9
M88 Towing IFV/CFV	0	5.7	0	5.7
M88 Towing GSRS	0	5.7	0	5.7

NOTE: No NOGO's on trails.

Table B41

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Wet Condition in HIMO Mid-East Study Area

Vehicles	Trails		Off-Road			
	Insufficient Traction	Total NOGO	Insufficient Traction	Obstacle Interference & Traction	Combination of Following: Obstacle, Vegetation, Soil & Slope	Total NOGO
<u>Individual Vehicle Performance</u>						
M578 Light Recovery Vehicle	0	0	0	10.7	0	10.7
M113A1 Armored Personnel Carrier (APC)	0	0	0	9.9	0	9.9
M109A1, 155 mm, Self-Propelled Howitzer	0	0	0	0.3	0	0.3
M107, 175 mm, Self-Propelled Howitzer	0	0	0	1.3	0	1.3
M110E2, 8 in., Self-Propelled Howitzer	0	0	0	0.5	0	0.5
M88 Medium Recovery Vehicle	0	0	0	0.5	0	0.5
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	0	0	6.5	0	6.5
GSRS, Ground Support Rocket System	0	0	0	6.5	0	6.5
<u>M578/M88 Towing Performance</u>						
M578 Towing M113A1	0	0	0	11.3	0	11.3
M578 Towing M107	0.1	0.1	0	14.9	0.2	15.1
M578 Towing M109A1	0.1	0.1	0	14.1	0	14.1
M578 Towing M110E2	0.1	0.1	0	14.9	0.2	15.1
M578 Towing IFV/CFV	0	0	0	14.2	0	14.2
M578 Towing GSRS	0.1	0.1	0	13.9	0	13.9
M88 Towing M107	0	0	0	6.4	0	6.4
M88 Towing M110E2	0	0	0	6.4	0	6.4
M88 Towing IFV/CFV	0	0	0	6.4	0	6.4
M88 Towing GSRS	0	0	0	6.4	0	6.4

Table B42

Percent of Distance NOGO on Trails and Percent of Area NOGO
Off-Road for Sand Condition in HIMO Mid-East Study Area

Vehicles	Trails		Off-Road				
	Insufficient Traction	Total NOGO	Insufficient Traction	Obstacle Interference & Traction	Combination of Following: Obstacle, Vegetation, Soil & Slope	Total NOGO	
<u>Individual Vehicle Performance</u>							
M578 Light Recovery Vehicle	0	0	0	10.7	0	10.7	
M113A1 Armored Personnel Carrier (APC)	0	0	0	9.4	0	9.4	
M109A1, 155 mm, Self-Propelled Howitzer	0	0	0	0	0	0	
M107, 175 mm, Self-Propelled Howitzer	0	0	0	1.3	0	1.3	
M110E2, 8 in., Self-Propelled Howitzer	0	0	0	0.5	0	0.5	
M88 Medium Recovery Vehicle	0	0	0	0.5	0	0.5	
IFV/CFV Infantry/Cavalry Fighting Vehicle	0	0	0	1.3	0	1.3	
GSRS, Ground Support Rocket System	0	0	0	1.3	0	1.3	
<u>M578/M88 Towing Performance</u>							
M578 Towing M113A1	0.1	0.1	0	14.9	0	14.9	
M578 Towing M107	12.6	12.6	11.6	13.1	0.4	25.1	
M578 Towing M109A1	10.6	10.6	10.2	12.4	0.9	23.5	
M578 Towing M110E2	12.6	12.6	11.6	13.1	0.4	25.1	
M578 Towing IFV/CFV	8.2	8.2	7.3	14.4	2.5	24.2	
M578 Towing GSRS	10.6	10.6	9.0	15.7	0.6	25.3	
M88 Towing M107	8.2	8.2	6.9	6.2	1.9	15.0	
M88 Towing M110E2	8.2	8.2	6.9	6.2	1.9	15.0	
M88 Towing IFV/CFV	1.8	1.8	0	5.9	2.3	8.2	
M88 Towing GSRS	7.2	7.2	0.8	6.2	6.7	13.7	

Table B43

Performance Data for Study Vehicles Crossing Linear Features (Water Crossing) in the HIMO West Germany Study Area

Vehicles	Hours Per Mile		
	Dry	Wet	Snow
<u>Individual Vehicle Performance</u>			
M578, Light Recovery Vehicle	0.0443	0.049	0.0497
M113A1, Armored Personnel Carrier (APC)	0.0592	0.0669	0.0641
M109A1, 155 mm, Self-Propelled Howitzer	0.0404	0.0432	0.0439
M107, 175 mm, Self-Propelled Howitzer	0.0437	0.0484	0.0491
M110E2, 8 in., Self-Propelled Howitzer	0.0437	0.0484	0.0491
M88, Medium Recovery Vehicle	0.0362	0.0393	0.0374
IFV/CFV Infantry/Calvary Fighting Vehicle	0.0407	0.0404	0.0413
GSRS, Ground Support Rocket System	0.0362	0.0422	0.0380
<u>M578/M88 Towing Performance</u>			
M578 Towing M113A1	0.0459	0.0504	0.0516
M578 Towing M107	0.0507	0.0546	0.0571
M578 Towing M109A1	0.0491	0.0532	0.0553
M578 Towing M110E2	0.0507	0.0546	0.0571
M578 Towing IFV/CFV	0.0491	0.0532	0.0553
M578 Towing GSRS	0.0491	0.0532	0.0553
M88 Towing M107	0.0403	0.0427	0.0416
M88 Towing M110E2	0.0403	0.0427	0.0416
M88 Towing IFV/CFV	0.0393	0.0419	0.0406
M88 Towing GSRS	0.0393	0.0419	0.0406

Table B44

Performance Data for Study Vehicles Crossing Linear Features (Water Crossing) in the HIMO Mid-East Study Area

Vehicles	Hours Per Mile		
	Dry	Wet	Sand
<u>Individual Vehicle Performance</u>			
M578 Light Recovery Vehicle	0.0328	0.047	0.0328
M113A1 Armored Personnel Carrier (APC)	0.0286	0.0296	0.0286
M109A1, 155 mm, Self-Propelled Howitzer	0.0202	0.0275	0.0202
M107, 175 mm, Self-Propelled Howitzer	0.0304	0.0376	0.0304
M110E2, 8 in., Self-Propelled Howitzer	0.0291	0.0370	0.0291
M88 Medium Recovery Vehicle	0.0211	0.0206	0.0211
IFV/CFV Infantry/Cavalry Fighting Vehicle	0.0191	0.0194	0.0191
GSRS Ground Support Rocket System	0.0211	0.0308	0.0211
<u>M578/M88 Towing Performance</u>			
M578 Towing M113A1	0.0334	0.0419	0.0334
M578 Towing M107	0.0353	0.0455	0.0353
M578 Towing M109A1	0.0346	0.0443	0.0346
M578 Towing M110E2	0.0353	0.0455	0.0353
M578 Towing IFV/CFV	0.0353	0.0443	0.0346
M578 Towing GSRS	0.0353	0.0443	0.0346
M88 Towing M107	0.0313	0.0306	0.0313
M88 Towing M110E2	0.0313	0.0306	0.0313
M88 Towing IFV/CFV	0.0288	0.0256	0.0288
M88 Towing GSRS	0.0288	0.0256	0.0288

APPENDIX C: COMPUTATION OF MOBILITY RATING SPEED FOR TACTICAL MOBILITY LEVELS

1. The equation for computing mobility rating speed is given as follows:

$$V_w = \frac{100}{\frac{P}{V_C} + PT_X + \frac{100 - P}{V_R}} \quad (1)$$

where:

V_w = mobility rating speed, mph, for a vehicle performing a mission for a specific area and condition

P = the percentage of expected off-road operating distance

V_C = the speed from the off-road profile, mph, corresponding to C

C = the percentage of the off-road terrain that should be negotiable

T_X = the time spent crossing linear features for each mile of off-road terrain traversed, hr/mi

V_R = the speed from the on-road speed profile, mph, corresponding to R

R = the percentage of the road and trail network that should be negotiable

2. The speed from the on-road profile, V_R , is not directly available from this study, but can be computed using the speeds from the profiles of the primary and secondary roads and trails as follows:

$$V_R = \frac{100 - P}{\frac{P_P}{V_{PP}} + \frac{P_S}{V_{SP}} + \frac{P_T}{V_{TP}}} \quad (2)$$

where:

P_P , P_S , P_T = percentage of the composite on-road and off-road network that are primary roads, secondary roads, and trails, respectively

V_{PP} , V_{SP} , V_{TP} = the speeds from the primary road, secondary road, and trail speed profiles, respectively, mph, that correspond to R

3. Equations 1 and 2 can be combined to yield the following:

$$V_W = \frac{100}{\frac{P}{V_C} + P T_X + \frac{P_P}{V_{PP}} + \frac{P_S}{V_{SP}} + \frac{P_T}{V_{TP}}} \quad (3)$$

4. For this report, values for P , P_P , P_S , and P_T in the HIMO West Germany study area can be found for each tactical mobility level in Table 5, main text. Values for V_C , V_{PP} , V_{SP} , and V_{TP} are available from the speed profiles for the study vehicles given in Tables B1-B36. Values for T_X for each vehicle are available in Tables B43 and B44.

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Randolph, Donald D

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